Universidad
Carlos III de Madrid
www.uc3m.es

Tesis Doctoral:

Essays on the Social Effects of Public Spending

Autor:

Federico Gabriel Masera

Director de Tesis:

Luis Corchon

Departamento de Economia

Getafe, Mayo 2017

Essays on the Social Effects of Public Spending

Autor:

Federico Gabriel Masera

Director de Tesis:

Luis Corchon

Firma del Tribunal Calificador:

Firma

Presidente:

Vocal:

Secretario:

Calificacion:

Getafe, de de

Contents

State, Religiosity and Church Participation

Federico Masera

Abstract

While most of the western world has faced a rapid process of secularization over recent generations, many other countries, especially in Latin America and the Muslim world, have maintained high levels of religiosity. Here, I propose a model of intergenerational transmission of religious values and competition between the state and the church that links changes in state efficiency to this dynamics. I show how, if the state becomes more efficient, agents vote for a higher size of the state. As the size of the state increases participation in church activities decreases and the next generation becomes less religious reinforcing the effect of the initial increase in the efficiency of the state. Because of this mechanism agents may have incentives to destroy part of the efficiency of the state in order to favor the church. I then provide some empirical evidence of this mechanism and show how it is only present for services provided by the state that are in direct competition with the church.

1 Introduction

Religious organizations and the state often provide goods and services that answer needs that are similar in nature. The provision of food and clothes to the poor, caring for sick patients at the hospital, job training and other services dispensed by religious organizations can be considered alternatives to many social programs of modern welfare states. In the US alone, more than 70 million Americans enjoy goods or services provided by church organizations [Tompkins and Webb (2008)]. As reported by the last National Congregations Study, almost all congregations are involved in some social services [Chaves, Anderson and Byassee (2009)]. Approximately half of the congregations have food programs, one-quarter reported home building, 20% have clothing programs and 15% offer help to the homeless. Similar results can be found in the Faith Communities Today national survey [Roozen (2008)]. In the year 2000, 84% of congregations had conducted some community service program, and this number rose to 94% in 2008.

In developing countries, the competition between the state and religious organizations is present in even more areas of daily life. For example, a 2006 UNDP report [Wojkowska (2006)] shows how the competition between informal religious justice systems and the formal judicial system of the state is wide-spread around the world. In many countries, these informal courts resolve between 80 and 90 percent of all disputes. As noticed by Berman and Laitin (2008), radical religious groups "are often efficient providers of valuable local public goods". For example, the Taliban in Afghanistan gained popularity in the late 90's by providing security against bandits who were stopping trade to Pakistan and Iran. Hezbollah has provided schools, charities and hospitals. In Sub-Saharan Africa, the pervasiveness of religious organizations is even more striking. Religious organizations provide many basic health and educational services in Tanzania [Jennings (2014)], Nigeria [Aremu (2015)] and Congo [Seay (2013)].

An important feature of these goods and services is that religious organizations tend to serve their own church-goers. As stated by Huber and Stanig (2011), "social services provided by churches are overwhelmingly religious, and that churches tend to cater to their own members". Additionally, it has been shown that religious organizations behave like a club by creating an insider-outsider identity [Lichterman (2008)]. There can be multiple reasons for this difference in treatment in the provision of services. Churches may decide to impose costs on religious participation and then provide some services as a club good to avoid incurring a free-riding problem [Iannaccone (1992); Berman (2000); Berman and Laitin (2008)]. Additionally, church-goers may have some informational advantage with respect to the services offered by the church. To rationalize why churches may decide to restrict access

to their goods and services, it has been observed by Dehejia, DeLeire and Luttmer (2007) that by doing so, religious organizations may be able to overcome some of the adverse selection and moral hazard problems that can arise in informal insurance contracts. This happens because churches may be better equipped to monitor the behavior of those that are part of their organization given the pervasiveness that this organization can have in the daily lives of church-goers. As a results of this, as shown by Lipford (1995), the free-rider problem is usually not an issue for religious organizations.

To study this competition between church and the state, I construct a model in which agents decide whether or not to participate in a religious organization. If an agent participates in a religious organization, he has to pay a participation fee. The religious organization use participation fees to provide goods. Some of these goods are exclusive to church-goers, while others are distributed publicly to all citizens. Agents also pay taxes that are then distributed back by the state as a publicly provided good. The amount of goods provided depends on the efficiency of the state. As discussed previously, goods provided by the church and the state are, at least in part, answering the same needs. There are two types of agents: secular and religious. They differ in the intrinsic value they attach to church participation. The timing is as follows: agents observe their type and vote for their preferred size of the state. After elections are resolved, they pay their taxes and decide whether to participate in church.

I first solve this model in a simple static framework in which both the efficiency of the state and the religiosity of individuals is exogenous. Here, I show that as the size of the state increases, the needs fulfilled by the church are, at least partially, already taken care of by the state. Because of this, an increase in the size of the state reduces church participation. The model exhibits heterogeneous responses of church participation decisions to changes in the size of state. Secular individuals go to church only if the size of the state is small, while religious individuals always go to church. Furthermore, the model predicts lower levels of participation in church activities as the efficiency of the state increases. This result links church participation to the institutions that govern the quality of goods produced by the state or restrains the possibilities of wasting resources by the state through corruption.

At the voting stage, religious individuals prefer the state to be a smaller size. The reason for this is two-fold. First, given that religious individuals participate more often in church activities, they do not need a large state, as some of their needs are already fulfilled by the church. Second, religious individuals use voting as a proselytization tool. When voting, religious individuals take into account that with a lower size of state, secular individuals will participate in church activities and more goods will be produced by the church.

The model is then included in an overlapping generations framework in which religiosity

is made endogenous by linking the religiosity of a child to the participation decisions and religiosity of the parent. Two stable equilibria are found: an equilibrium in which a large share of individuals are religious, everybody goes to church, and the state is very small, and one in which in the long-run, everybody becomes secular, nobody goes to church, and the state is large. The model suggests that the main driver of secularization in a society is an increase in the relative efficiency of the state with respect to the church in providing goods and services. This result may offer some new insights on the determinants of the secularization in the Western world, while high levels of religiosity are maintained in many inefficient or failed states.

Given the importance of the efficiency of the state in determining the joint dynamics of religiosity and the size of the state, it is essential to understand what may determine the state efficiency of a country. To do so, I extend the basic static framework, by giving citizens the possibility of decreasing the efficiency of the state. Citizens could do so by voting for a corrupt politician or one that would decrease the state efficiency, damaging public property, doing violent acts against the state, and so on. Without the presence of the church, no citizen would want to damage the efficiency of the state because, in such a case part of the goods provided by the state would be wasted by this inefficiency. With the presence of the church, there may instead be an incentive for damaging the efficiency of the state, because a more inefficient state creates higher incentives for citizens to go to church. This then leads to more participation fees for the church and more goods provided by the religious organization, ultimately favoring church-goers. The presence of this mechanism may create a situation in which agents have incentives to destroy part of the efficiency of the state. This is especially true for religious individuals who are the ones usually benefiting from the increased production of the church. This mechanism helps explain why some states are stuck in a cycle of inefficient states produced by inept politicians or acts of violence against the state, low levels of public goods provided by the state and high levels of religiosity.

I then empirically explore the relationship between religiosity and the size of the state by using different waves of the International Social Survey Program (ISSP), which collects data on religious habits and preferences over the size of the state. The results are in line with the comparative statics of the model. I document a negative correlation between the size of the state and the frequency of participation in church activities. This correlation persists after controlling for many observable country characteristics, country fixed effects and individual characteristics. As predicted by the model, this negative correlation only exists for secular individuals. Furthermore, this negative correlation is only observed when examining dimensions of state spending that are in direct competition with goods and services provided by churches. I also show how measures of state efficiency in providing public goods are neg-

atively correlated to participation in church activities, even after controlling for the size of the state. Finally, preferences over the size of the state are shown to be negatively correlated to religiosity but only if the spending is directly in competition with goods provided by the church.

These results first contribute to the literature that studies the determinants of religiosity. Trends towards a more secular society have been attributed to changes in characteristics of countries such as income per capita [Paldam and Gundlach (2012)], credit availability [Chen (2010)], growth [McCleary and Barro (2006)], education [Franck and Iannaccone (2009)], Human Development Index [Gaskins, Golder and Siegel (2013)], poverty [Berman (2000)] and laws regarding the use of the veil [Carvalho (2013)]. More closely related to this paper, I build on the empirical insights of Hungerman (2005), Gruber and Hungerman (2007) and Gill and Lundsgaarde (2004) which study how an increase in the size of the state, especially if directly related to goods and services are provided by the church, can explain the secularization of a society.

Secondly, the results of this paper contribute to the literature on the differences in the preferences and decisions of religious individuals. For example Guiso, Sapienza and Zingales (2003) show how several economic attitudes and preferences are strongly correlated to the strength of one's religious beliefs. They find that religious individuals trust others more, trust the government and the legal system more, are less willing to break the law and are more likely to believe that markets' outcomes are fair. On the other hand, religious individuals have been found to be more intolerant of foreigners and less sympathetic to women's rights. Religiosity has also been shown to negatively influence growth [McCleary and Barro (2006)], preferences for the redistribution of income [Huber and Stanig (2011); Stegmueller et al. (2012); Gaskins, Golder and Siegel (2013)] and the rate of innovation [Bénabou, Ticchi and Vindigni (2015)]. More in line with my research question, Scheve and Stasavage (2006) have found that welfare expenditure in a country is negatively correlated both with average religiosity and participation in religious activities in these countries. They find that in high-income OECD countries, individuals that participate more often in church activities also prefer less social spending by the state. Stegmueller (2010) shows that religious individuals indeed prefer lower social spending but only when it is aimed at individuals who are thought to be deservingly in that condition (like the unemployed). In this paper, I provide a theoretical model to rationalize these results in which individuals who differ in religiosity may vote differently on the size of the state. Furthermore, I also study the feedback loop that the decisions about the size of the state create on the religiosity and church participation of individuals.

Additionally, this paper also contributes to the literature that identify the determinants of

preferences over the role of the state. As shown by Alesina, Glaeser and Sacerdote (2001), the amount of redistribution varies systematically across countries. Benabou and Tirole (2006) and Alesina and Angeletos (2005) that differences in preferences for redistribution and the size of the welfare state can be explained by how much individuals think the world is just or markets are fair, respectively. In an extensive literature review, Alesina and Giuliano (2009) show how there are many determinants of preferences for redistribution. Income, education, employment status, race, sex, and belief in the fairness of the markets are all shown to have a sizable effects on preferences for redistribution. Other determinants include the possibility of upward mobility of income [Ravallion and Lokshin (2000); Benabou and Ok (2001); Alesina and La Ferrara (2005)], or culture [Luttmer and Singhal (2011)]. The contribution of this paper is to theoretically propose and empirically test a new mechanism that explains how religiosity and the presence of the church may also influence preferences over the role of the state.

Finally, these results also add to the literature on the causes of state failure or inefficiency. Many factors have been shown to be important determinants of state failure: civil violence generated by natural resource richness [Ploeg (2011)] or ethnic diversity [Alesina and Ferrara (2005)], monetary resource windfall [Brollo et al. (2013)], limited morality cultural values [Tabellini (2007)], patronage politics [Acemoglu, Ticchi and Vindigni (2011)], the absence of the absence of the right kind of judicial and fiscal institutions [Acemoglu and Robinson (2012); Besley and Persson (2011)]. Here, I show how the presence of a competitor of the state (the church) may create incentives for citizens to damage state efficiency to favor this competitor making it impossible to have an efficient state.

In the next section I build the basic theoretical framework and then extend it to make religiosity and state efficiency endogenous. In Section 3 I present the main empirical results that explore the links between church participation, religiosity and the size of the state. I conclude with a discussion on how the mechanisms discussed could be present in other similar situations in which a non-state organization and the state compete in the provision of certain goods. These other non-state organizations include mafias, terrorists or violent groups and local gangs.

2 Model

2.1 The Static Model

Consider a measure one of agents that can be of two types: secular or religious. The type is denoted by τ and measures the intrinsic value (λ_τ) that an agent attaches to participating in

church activities. Religious types are an exogenous fraction q of the population. All agents decide simultaneously whether to participate in church activities ($p_i = 1$) or not ($p_i = 0$). With P, I denote the measure of church-goers. If an agent decides to participate he has to pay a participation fee normalized to 1. This participation fee includes all the monetary costs, time invested in church activities and societal restrictions that need to be endured to be recognized by the religious organization as a church-goer. The church then distributes $h_1(P)$ goods to all agents, regardless of whether they participate in church activities or not, and $h_2(P)$ goods only to church-goers. As discussed in the introduction, this is meant to capture the fact that some of these goods and services tend to cater to church-goers. Agents also pay taxes (t) that are then transformed by the state into $\alpha f(t)$ units of a publicly provided good. The basic state production function is $f(.)$. Countries may differ by the state efficiency α. The timing is as follows: each agent i first observes his own type and the share of religious agents q, then votes sincerely on the level of taxation[1] t_i^*. The taxation preferred by the majority is implemented. After observing the voting results, each agent i pays taxes and decides whether to participate in church activities.

The utility of agent i of type τ with participation decision p_i when a measure P agents participates in church activities and t is the size of the state is as follows:

$$U_{i,\tau}(p_i, P, t) = W(\alpha f(t)\ ,\ h_1(P) + h_2(P)\, p_i) - t - p_i + \lambda_\tau p_i \tag{1}$$

The utility of agent i depends on the consumption of goods produced by the state and the church. As discussed in the introduction, part of the goods produced by the church are only accessible if a person participates in church activities. However, the state distributes goods in an equal manner to all agents. The utility of agents depends on how much they have to pay in taxes, the fee for participation in church activities and the intrinsic value that the agent gives to participating in church. This value is completely independent of the amount of goods produced by the church and only depends on the agent's type. The main interaction between these factors that I want to study is the substitutability between state and church provided goods. To capture this, I use the function $W(.)$ and the cross-derivative of this function as a way of modeling this substitutability.

Assumption 1. $\lambda_R > 1,\ \lambda_S = 0$

Assumption 2. $W_1', W_2' > 0\ ,\ W_{22}'', W_{11}'', W_{12}'' < 0,\ lim_{x\to\infty} W_2'(x, y) = 0$

[1] As there is a one to one function that matches taxes (t) to the size of the welfare state ($\alpha f(t)$) we can also view this as voters voting over the size of the state.

Assumption 3. $\alpha > 0,\ f', h_1', h_2' \geq 0,\ f'', h_1'', h_2'' \leq 0,\ and\ f(0) = h_1(0) = h_2(0) = 0$

Assumption 1 defines an agent as religious if it is willing to go to church only motivated by the intrinsic value associated with going to church. On the other hand, secular agents only care about the goods and services provided by the church when making the participation decision. Assumption 2 states that the utility function is increasing with the amount goods consumed by the agent (either produced by the state or the church). The assumption $W_{12}'' < 0$ captures the fact that goods provided by the church and those provided by the state answer similar needs (i.e., these goods are strategic substitutes). What these goods and services are depends on the context studied. In a developed country, these goods include basic education, health services, help to the poor and, more generally, the welfare system. In many developing countries, these goods may include the justice system, public safety and many other more basic publicly provided goods. This is an important assumption to consider when bringing the results to the data and selecting which type of state spending to focus on. The last assumption ($lim_{x\to\infty} W_2'(x, y) = 0$) specifies that in the limit where the state is infinitely big the utility is not affected by what the church does. This assumption is just needed to rule out some unusual equilibrium behavior that may happen at the limits even if in reality the state will never be infinitely sized. Finally, assumption 3 describes the production function of the state and the church. The amount of goods provided by the state is increasing with the taxes paid. The amount of goods delivered by the church is increasing with the number of church-goers. Importantly, here I assume that congestion economies in the church are not strong enough to reduce production by the church as more agents go to church. In particular, $h_2' \geq 0$ states that the amount of goods that every church-goer receives is increasing with the number of church-goers. This assumption is in line with the type of services provided by the church. In particular, these services can be considered as a general form of insurance based on the network created by the church. In these situations (especially with idiosyncratic shocks), larger pools are preferred. Furthermore, goods and services provided by the church are also generally local (risks and benefits are shared locally). This makes it difficult to reach a congestion productivity peak, even if all the citizens go to a particular church, because the total pool of citizens is typically small. Furthermore, if this peak were ever to be reached, there would always be the possibility of splitting into smaller geographical areas. Finally, taking into account that the empirical analysis is based on developed countries, it is safe to assume that these countries are far from reaching high levels of congestion in the church. The production functions of the state and the church are both concave.

We now solve the game backwards, first searching for the optimal participation behavior of the agents for each possible realization of the voting stage. One important thing to notice is that the incentives to participate in church activities may increase as an increasing number

of agents decide to go to church. Intuitively, if more agents participate in church activities, given assumption 3, more goods are delivered by the church, and this further increases the incentive to go to church. These strategic complementarities between player actions create a coordination problem with a multiplicity of equilibria for some values in the parameter space. I select a unique equilibrium using the global game methodology. The main intuition behind this methodology is to add a specific type of noise to the payoff function of the original game. As first shown by Carlsson and Van Damme (1993) and then extended to infinite player games by Morris and Shin (2003) and Frankel, Morris and Pauzner (2003), under certain regularity conditions, as the noise goes to zero and we approach the original payoff function, a unique strategy survives the iterated deletion of dominated strategies. A detailed explanation of the implementation of this methodology is left for the Web Appendix. To comply with the usual regularities conditions of the global game, a last assumption is necessary.

Assumption 4. $\frac{\partial U_{i,\tau}}{\partial P}(1, P, t) > \frac{\partial U_{i,\tau}}{\partial P}(0, P, t)$

Assumption 2 and 3 state that as the number of church-goers increases, more goods are produced by the religious organization and the utility of all agents increases. What Assumption 4 adds is that these utility gains are higher for church-goers. In other words, church-goers are the ones gaining the most as the church produces more goods and services. Assumption 4 is a natural assumption that guarantees that the strategic complementarities between participation decisions are present in all the parameter space. With assumptions 1 to 4 I can identify the optimal participation in church activities for all agents. Any indifference is resolved in favor of not participating in church.

Proposition 1.
Under Assumptions 1 to 4 participation strategies in equilibrium are symmetric for agents of the same type. All secular agents participate in church activities with probability p_S^* *while religious agents have probability* p_R^*.

$$\textit{Where } (p_S^*, p_R^*) = \begin{cases} (1,1) & \textit{if } \ t < \hat{t} \\ (0,1) & \textit{if } \ t \geq \hat{t} \end{cases}$$

and $\hat{t}$ *is (weakly) decreasing in* α *and (weakly) increasing in* q. [2]

In equilibrium, religious agents always participate in church activities, while secular agents' optimal strategy depends on the size of the state. The first new testable hypothesis is that

[2]Proofs for all propositions can be found in appendix.

only secular agents react to changes in the size of the state. In particular, they decide to participate in church activities whenever the size of the state is under a certain threshold ($\hat{t}$). As the size of the state increases, the needs fulfilled by the goods provided by the church are, at least partially, already taken care of by the state and secular agents no longer need to participate in church activities. In contrast, religious agents, given Assumption 1, always have an incentive go to church.

Additionally, we can study how the threshold $\hat{t}$ changes with some parameters of the model. This is interesting because as $\hat{t}$ increases, for the same size of the state t, we could transition from a situation in which only religious agents go to church to a situation in which secular agents also participate. First, notice that the share of religious agents in a country (q) positively influences $\hat{t}$. This is because as the share of religious agents increases, more goods are produced by religious organizations, ultimately increasing the incentives to participate in church activities for secular agents. The effect of state efficiency (α) on $\hat{t}$ is exactly the opposite. In this case, as the state become more efficient, the state can distribute more goods and services with the same amount of taxation. As α increases, it reaches a point at which it crowds out the services provided by the church, and secular agents start to not participate in church activities.

Now, I solve the optimal voting decision in the first stage, taking into account the participation decisions of the second stage. Given the previous results, we can rewrite the optimal participation rules as a function of the taxation level $p_S^*(t)$, $p_R^*(t)$. Notice that $p_R^*(t) = 1$ for every level of t. With a slight abuse of notation, we can re-write the utility function to be only a function of taxes as follows

$$U_{i,\tau}(t) = W(\alpha f(t)\ ,\ h_2(q + (1-q)p_S^*(t))\ p_\tau^*(t) + h_1(q + (1-q)p_S^*(t))) - t - p_i + \lambda_\tau p_i \quad (2)$$

The voting process works as follows: after observing their type and the share of religious agents, agents vote sincerely for their preferred size of the state. After the voting takes place, the majority winner is implemented.

Formally, I define (t_S^*, t_R^*, t^*) as a voting equilibrium in which t_τ^* is the preferred size of the state for agents of type τ. Given that agents vote sincerely, we have $t_\tau^* \epsilon argmax_{t\geq 0}\ U_{i,\tau}(t)$ t^* is the implemented size of the state, and given the majority rule, we have:

$$t^* = \begin{cases} t_R^* & \text{if } \ q > \frac{1}{2} \\ t_S^* & \text{if } \ q \leq \frac{1}{2} \end{cases}$$

Proposition 2. *Under assumptions 1 to 4:* $t_S^* \geq t_R^*$

Proposition 2 states that secular agents prefer a (weakly) larger state than religious agents. The reason is two-fold. The first, more direct reason, is that religious agents always participate in church activities, an thus they do not need a large state, as the church is already taking care of many of their needs. Interestingly, there is also a second reason for this equilibrium result that has not been discussed before in the literature. Religious agents can use voting as a proselytization tool. In other words, when voting, religious agents take into account that a smaller state induces secular agents to participate. This ultimately increases the production of the church and favors religious agents. This means that religious agents can use voting for a small state as a way of convincing secular agents to participate and ultimately increase their own utility.

Furthermore, Proposition 2 gives a new theoretical explanation to a phenomenon that has often been observed by many political scientists: individuals who are socially conservative (in the model religious agents) tend to be more liberal in decisions on the role of the state (in the model low taxes and small size of the state). Empirical evidence of this can be found looking at the location of political parties or candidates in a 2-dimensional political space. In this political space, one dimension concerns economic issues (Left-Right) and the other one concerns social issues (Authoritarian-Libertarian). Political scientists have noticed that in many elections, parties and candidates are located in a line instead of occupying all the political space. The usual disposal of parties in this political space is that economically right wing parties also tend to be more conservative on social issues, while economically left wing parties tend to be socially liberal. This behavior has been observed in US congressional voting by Poole and Rosenthal [Poole and Rosenthal (1984), Poole and Rosenthal (1991)]. The website policalcompass.org provides many examples of this phenomenon for modern elections in Germany, Australia, New Zealand, Canada and the US.

In order to explore the dynamics of religiosity, it is useful to find the close form of the optimal voting functions for secular (t_S^*) and religious agents (t_R^*). To have a well-behaved solution, the following assumption is introduced.

Assumption 5. $\frac{\partial W(\alpha f(t),(h_1(1)+h_2(1))}{\partial t} < 1$

This assumption states that in a situation in which all agents go to church, the marginal benefit of increasing the size of the state is lower that the marginal cost, which is one. In other words, under the extreme situation in which all agents participate in church activities, additional state expenditure is inefficient. To identify optimal voting behavior, any indifference is resolved in favor of voting for the greater size of the state.

Proposition 3.

Under assumptions 1 to 5 the voting equilibrium is:
For religious types: $t_R^* = 0$

$$\textit{For secular types: } t_S^* = \begin{cases} 0 & \textit{if } \alpha < \tilde{\alpha} \\ \tilde{t} & \textit{if } \alpha \geq \tilde{\alpha} \end{cases}$$

$$t^* = \begin{cases} 0 & q > \frac{1}{2} \quad or \quad \alpha < \tilde{\alpha} \\ \tilde{t} & q \leq \frac{1}{2} \quad and \quad \alpha \geq \tilde{\alpha} \end{cases}$$

Where $\tilde{\alpha} : W(0, h_1(1) + h_2(1)) - W(\tilde{\alpha} f(\tilde{t}(\tilde{\alpha})), h_1(q)) - 1 + \tilde{t} = 0$
and $\tilde{t}(\alpha) : \alpha f'(\tilde{t}) W_1'(\alpha f(\tilde{t}), h_1(q)) - 1 = 0$

As observed previously in Proposition 2, $t_R^* \leq t_S^*$. Additionally, with Assumption 5, we have a closed form solution of the voting strategies for both types of agents. In equilibrium, religious agents always vote for the smallest state possible, while secular agents vote for a small or a large state depending on the efficiency parameter α. In particular, in a situation in which the state is very inefficient, both secular and religious agents agree on voting for a small state. The disagreement starts as soon as the efficiency of the state exceeds a certain threshold, and in this case, elections are resolved in favor of the largest group.

2.2 The Dynamics of Secularization

I now present a dynamic version of the model in which the type of the agents is made endogenous. Agents live for 2 periods the first as children and the second as adults. Every child has one adult parent. When the agents are children, they make no active decision and just acquire their level of religiosity (τ). Their level of religiosity will depend on both the participation decision and religiosity of the parent. Then, at the beginning of their adulthood, every agent has a child. The rest of their adult life follows the static version of the model; agents take their level of religiosity (τ) as given, vote on the size of the state and decide whether to participate in church activities.

The inter-generational transmission of religious values works as follows. First, if the parent participates in church activities, the child will become religious with probability c. This captures church socialization of religious norms. This type of socialization is based on the fact that children often follow their parent to church where they may be introduced to religious ideas. This type of socialization then influences religiosity as an adult [Francis and Brown (1991); Francis (1993)]. Second, religious parents may also transmit religious

belief directly to children at home; I call this home socialization. This captures the usual socialization inside the family**,** also known as direct vertical transmission of cultural traits and social norms [Bisin and Verdier (2010)]. The main idea behind vertical transmission of norms is that parents transmit with some probability their own type directly to their child. In my model, b represents the probability that religious values are successfully transmitted at home. For the theoretical analysis, the probability of the success of church and home socialization are considered independent. A child will not be religious as an adult if both church socialization and home socialization fail. In the Web Appendix, I present empirical evidence that the intergenerational transmission of religious values is linked to religiosity and church participation of the parents. Using retrospective questions found in the ISSP dataset [3], I show that even controlling for many observables, being raised in a religious family and having parents that participated in church activities is always positively correlated with being religious as an adult. Being raised in a religious family increases probability of being religious as an adult by 8 percentage points (an increase of 55%) and having a parent who went to church when a person was a child increase that probability by 3 percentage points (an increase of 20%).

Before writing down the dynamic model is useful to define the function that links participation equilibrium behavior to the share of religious individuals q. Using the function $t^*(q)$ from Proposition 3 and $p^*_\tau(t)$ from Proposition 1, we can define the following function $P^*_\tau(q) \equiv p^*_\tau(t^*(q))$. We can then use the definition of intergenerational transmission and $P^*_\tau(q)$ to link the share of religious individuals at generation g (q_g) to the share of religiosity of the next generation (q_{g+1}) in the following way:

$$q_{g+1} = (1 - (1-b)(1-c))\, q_g + c\, P^*_S(q_g)\, (1 - q_g)$$

What this dynamic equation states is that the next generation's share of religious individuals (q_{g+1}) will be some of the children of the religious individuals of this generation (q_g). The children of religious parents that are not religious upon reaching adulthood are only the ones for whom both church and home socialization fail, which happens with probability $(1-b)(1-c)$. In addition, some children of the secular parents of generation g may become religious in generation $g+1$. These are the children of secular parents who go to church ($P^*_S(q_g)(1-q_g)$) and are made religious by church socialization.

Definition 1. q^* is a (locally) stable equilibrium if:

1. $q^* = (1 - (1-b)(1-c))\, q^* + c\, P^*_S(q^*)\, (1 - q^*)$

[3] A complete description of the ISSP dataset and the waves used is provided in the Web Appendix.

2. $\exists \delta > 0 : \; if \; q_g \in (q^* - \delta, q^* + \delta)$ then $\; lim_{g \to \infty} q_g = q^*$

Where part 1. defines q^* as a fixed point of the equation that describes the dynamics of intergenerational transmission of religiosity. Then, part 2. introduces the concept of local stability.

Proposition 4. *Under assumptions 1 to 5 the stable equilibria are:*

1. $q^* = 0 \quad if \;\; \alpha \geq \tilde{\alpha} \qquad$ *(Secular Equilibrium)*

2. $q^{**} = \frac{c}{1-b+cb} \quad if \;\; \alpha < \tilde{\alpha} \;\; or \;\; \frac{c}{1-b+cb} > \frac{1}{2} \qquad$ *(Religious Equilibrium)*

Where q^{**} is increasing in c.

Proposition 4 states that two stable equilibria exist: One in which all the individuals are secular and another in which religious individuals are the majority. The main determinant of long-run religiosity is the state efficiency α. To illustrate the dynamics of this process in Figure 1, I present 3 examples of possible phase diagrams. The top-left graph of Figure 1 shows a phase diagram in which the only equilibrium is the religious one. This occurs when α is small ($\alpha < \tilde{\alpha}$). In this case, independent of the starting situation, all agents vote for the smallest size of the state possible, and the dynamics will move to an equilibrium where $\frac{c}{1-b+cb}$ share of the individuals are religious[4]. As α increases, secular individuals start voting for a bigger state. The top-right graph of Figure 1 shows a situation in which both stable equilibria co-exist. This situation is possible when $\alpha > \tilde{\alpha}$, leading secular individuals to vote for a large state. At the same time, church and home socialization are very effective ($\frac{c}{1-b+cb} > \frac{1}{2}$) pushing the dynamics in the other direction. Finally, the bottom graph of Figure 1, depicts a situation in which the dynamics slowly move towards a situation where in the long-run, all individuals will be secular and there will be a large state independent of the starting point. This is possible when the state is very efficient and at the same time socialization at home and at church are not. These results show that changes in the efficiency of the state and the strength of religious socialization are important factors when trying to understand the secularization of much of the western world in the last few generations. Conversely, these dynamics may be able to explain the persistence of high levels of religiosity in so many developing or failed states.

[4]Notice that $\frac{c}{1-b+cb}$ is a properly defined share given that b and c are the probabilities of 2 independent events.

2.3 Endogenous State Efficiency

Given the central role that state efficiency plays in determining the dynamics of religiosity and the size of the state, it is important to understand how state efficiency (α) can be determined. In this extension of the basic model, I study which is the preferred level of state efficiency for religious and secular agents. When studying the preferred state efficiency, the agent religiosity τ, the share of religious individuals q and the size of the state t are taken as given. What I show is that agents, particularly religious ones, may be willing to choose a level of efficiency of the state lower than the maximum obtainable one. This provides another channel that may link religiosity to the presence of a small and potentially inefficient state. Formally, the preferred level of state efficiency can be written as following:

$$\text{argma}x_{\alpha\epsilon[o,\overline{\alpha}]} W(\alpha f(t)\ ,\ h_2(P(\alpha))\, p_i(\alpha) + h_1(P(\alpha))) - t - p_i(\alpha) + \lambda_\tau p_i(\alpha)$$

The parameter $\overline{\alpha}$ represents the maximum obtainable state efficiency. Agents could lower the state efficiency below the maximum obtainable level by voting for a corrupt or inept politician, damaging public property, doing violent acts against the state, and so on. Notice that here, there are no direct gains from accepting state inefficiencies but only direct costs (a reduction of the goods produced by the state $\alpha f(t)$). Because of this, if one looks only at the direct effect of reducing α, no agent would ever agree to reduce the level of efficiency of the state below the maximum obtainable level ($\overline{\alpha}$). The reason that a reduction of α below the maximum obtainable level may be profitable is the existence of indirect benefits of a reduction of α. As shown in Proposition 1, a lower α may convince some individuals to participate in church activities. The reason for this is that as the state efficiency decreases, services provided by the state no longer completely crowd-out the church. Because of this, more individuals go to church, more goods are produced by this religious organization, profiting some agents. To better understand these indirect benefits of lowering α, it is helpful to re-write the optimal participation in church activities found in Proposition 1 in the following way:

Corollary 1.
Under Assumptions 1 to 4 participation strategies in equilibrium are symmetric for agents of the same type. All secular agents participate in church activities with probability p_S^*, while religious agents do so with probability p_R^*.

$$(p_S^*, p_R^*) = \begin{cases} (1,1) & \textit{if}\ \ \alpha < \hat{\alpha} \\ (0,1) & \textit{if}\ \ \alpha > \hat{\alpha} \end{cases}$$

Where $\hat{\alpha} : \int_0^1 W(\hat{\alpha} f(t), h_2(q+(1-q)p_S) - W(\hat{\alpha} f(t), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S + 1 = 0$

The threshold structure of Proposition 1 is maintained. Taking into account both the direct and the indirect effects of changes in state efficiency the optimal level of α for secular and religious agents is shown below.

Proposition 5. $\alpha_\tau^* = \begin{cases} \overline{\alpha} & \textit{if } \overline{\alpha} < \hat{\alpha} \textit{ or } \overline{\alpha} > \alpha_\tau \\ \hat{\alpha} & \textit{otherwise} \end{cases}$

and $\alpha_R > \alpha_S$

The results show how there are indeed some values of $\overline{\alpha}$ for which individuals are willing to accept some level of state inefficiency. State inefficiency is optimal for an agent only if the loss in goods that the state produces is more than compensated by the gains that would come from convincing other agents to participate in church activities. In the case that $\overline{\alpha}$ is already very low (for $\overline{\alpha} < \hat{\alpha}$), there are no incentives in further reducing the efficiency of the state because as shown in Corollary 1, everybody is already participating. In the case that $\overline{\alpha}$ is very high (for $\overline{\alpha} > \alpha_R$), the state efficiency has to be reduced by too much to make secular individuals start participating in church activities. In other words, the costs of a reduction in state inefficiency is too high with respect to the indirect gains. For intermediate values of $\overline{\alpha}$ (for $\overline{\alpha} \epsilon [\hat{\alpha}, \alpha_R]$), state inefficiency is optimal. For these values of $\overline{\alpha}$ the cost of convincing a secular agent to participate is lower than the gains from more people participating in church activities.

Finally, notice how this intermediate region can be further separated into two distinct subregions. For some values of $\overline{\alpha}$ (for $\overline{\alpha} \epsilon [\hat{\alpha}, \alpha_S]$), all the individuals agree that they should have a certain level of inefficiency. In this case, a known corrupt politician could actually win the elections even if he keeps all of the gains from the corruption for himself. For some other values found in this intermediate region (for $\overline{\alpha} \epsilon [\alpha_S, \alpha_R]$), there is some disagreement. In particular, only religious types would like some form of inefficiency while secular individuals are better off if the state produces at its maximum efficiency.

These results demonstrate that is possible for individuals to want corruption and inefficiencies in the state even if they do not have directly benefit from them. There are two reasons why this is the case. First, religious individuals would like secular individuals to participate in church activities (because of $h_2' > 0$). As shown in Corollary 1, one way of convincing secular individuals to do so is by decreasing α. Second, reducing the efficiency of the state can solve the coordination problem that secular individuals face when deciding whether to participate in church activities. This coordination problem exists because for some values in the parameters space, there is the possibility for gains if all secular individuals coordinate and start going to church even if individually it is not rational. This coordination

can be solved by reducing the efficiency of the state to the point that all secular individuals decide to go to church.

3 Empirical Application

The objective of this chapter is to present some evidence of the prediction of the model obtained in the previous section. I first look at church participation, particularly how it relates to spending by the state. Second, I study the relationship between voting preferences over the size of the state and religiosity. Special care is taken in controlling for other alternative explanations of the determinants of participation in church activities and preferences of over the size of the state found in the literature.

3.1 Participation in Church Activities

For this analysis, I use information from the International Social Survey Program (ISSP), which is a compilation of cross-country surveys devoted each year to different specific topics. In 3 years (1991, 1998 and 2008), the survey was devoted to the study of religious behaviors and beliefs across 38 countries. This particular dataset has been used by other authors in the literature such as Iannaccone (2003); McCleary and Barro (2006); Scheve and Stasavage (2006); Stegmueller (2010) because of the numerous types of questions that are available assessing different aspects of the religious life of individuals. Of particular importance for this analysis is the possibility of having measures both of attendance at religious service and intensity of religious beliefs. This is an important distinction between religious actions (p_i) and religious types (τ) that is made in the model and has previously been neglected in this empirical literature. The Web Appendix contains a careful description of the variables used in the empirical analysis with a complete list of countries of countries with summary statistics of the most important variables

I run the first set of regressions aimed at understanding the factors associated with church participation and finding whether empirical regularities are in line with the results found in Proposition 1. The preferred specification for this set of regressions takes the following form:

$$Prob(p_{i,c,t} = 1 \mid Z_{i,c,t}) = \phi(\theta_1 r_{i,c,t} + \theta_2 W_{c,t} + \theta_3 r_{i,c,t} * W_{c,t} + \theta_4 \bar{r}_{c,t} + \theta_5 GE_{c,t} + \theta X_{i,t,c} + \epsilon_{i,c,t} > 0) \quad (3)$$

Where i identifies the individual, c the country and t the year. On the left-hand side, $p_{i,c,t}$ is a dichotomous variable that is one if the individual goes in church several times a

year. The theoretical counterpart of this variable is the participation to church (variable $p_{i,\tau}$ in the model). On the right-hand side, I control for various regressors $Z_{i,c,t}$ that include $r_{i,c,t}$, a dummy variable that takes the value 1 if the individual describes himself as very or extremely religious. In the theoretical model, this represents the type of individual τ that is either R if religious and S if secular. $W_{c,t}$ is the welfare expenditure. For the main results, the OECD measure of total social spending as a percentage of GDP is used. For the countries in this dataset, these are goods and services that answer needs similar with respect to the ones provided by religious organizations. The theoretical counterpart is t. Furthermore, the interaction between these 2 regressors is added ($r_{i,c,t} * W_{c,t}$) to check whether correlations between church participation and the size of the state varies between religious and secular individuals as suggested by Proposition 1. Additionally, I control for the share of religious individuals in a country ($\bar{r}_{c,t}$) and the state efficiency index from the "Worldwide Governance Indicators" produced by the World Bank ($GE_{c,t}$). These 2 observables are proxies in the model for the variables q and α that represent the share of individuals that are of type R and the efficiency of the state, respectively. Many other observable individual and country characteristics are added to the regression ($X_{i,t,c}$). Furthermore, in my most preferred specification, I add country fixed effects. This implies that the variation exploited in the estimation are changes of the variables of interest inside a country between different years or individuals.

Table 1 contains the marginal effects of some regressors of interest of the PROBIT estimates of the equation (3). Column (1) contains the most basic regression in which the individual participation decision is regressed only on observable individual characteristics, time fixed effect and the size of the welfare state. Column (2) introduces country fixed effects. Finally, column (3) is the preferred specification and also includes the interaction between welfare spending and religiosity.

First, not surprisingly religiosity is positively correlated to participation decisions of individuals. Welfare state spending is negatively correlated to church participation. The marginal effect of the interaction term is positive as observed in column (3). In other words, the correlation between welfare spending and participation in church is more negatively correlated for secular individuals. The share of religious individuals is positively correlated to church participation, while state efficiency is negatively correlated. All these correlations are in line with the comparative statics shown in Proposition 1 that demonstrates that religious individuals go to church more often and that increases in state efficiency (α) decrease the probability of going to church, while increases in the share of religious individuals (q) increase this probability. All these results are highly statistically significant. Finally, increases in the welfare state make secular individuals participate in church activities more often while not

affecting religious individuals. This last result is in line with the coefficients shown in column (3) in which the correlation between the size of welfare spending and participation for secular individuals is negative and significantly different from zero, while the correlation between the size of the welfare state and participation in church for religious individuals is not significantly different from zero (test for $\theta_2 + \theta_3 \neq 0$ not reported in Table 1 has $p - value = 0.53$).

To have an idea of the size of these effects I use the estimates of column (3) and present the degree to which a one standard deviation change in some variables of interest affect the probability of participating in church activities. For example, a one standard deviation increase in the share of GDP spent on the welfare state implies a 4 percentage point decrease less in the probability of participating in church activities for non-religious individuals and only a 0.8 percentage point decrease for religious ones. The decrease for religious individuals is not statistically different from zero. Finally, a one standard deviation increase in state efficiency implies a 4 percentage point decrease in the average probability of participating in church activities. Additionally, I show how these results are robust to a different definition of being religious and participation to church activities. I also provide evidence of how the results are robust to different measure of the size of the state and estimation strategies (results found in the Web Appendix).

Finally, to provide further evidence of the mechanism, I run a series of placebo regressions in which I include measures of the size of the state in sectors that do not compete with what religious organizations provide for the countries in my sample. These public expenses are military expenditures, tertiary education and R&D. I also include the sum of all state expenses that are not welfare expenditures. In Table 2, we can see how all these measures of public spending are either positively or not statistically correlated to church participation. These results give further evidence to the fact that the main driver of the results shown in Proposition 1 is the direct competition of some state goods and services with the ones provided by the church. In terms of the model, W''_{12} is equal to zero for state expenditures unrelated to the welfare state in the countries included in the sample. Because of this, I do not observe the effects of state spending on participation in church.

3.2 Preferences Over the Size of the State and Religiosity

I now study the empirical relationship between preferences over the size of the state (PSS) and religiosity to determine if the results are in line with Proposition 2. For studying the determinants of the preferences over the size of the state, I merge the 1990, 1996 and 2006 waves of the ISSP, which include 32 countries and approximately 50,000 observations.

The econometric specification has the following form:

$$PSS_{i,c,t} = \delta_1 r_{i,c,t} + \delta_2 X_{i,t,c} + \delta_3 Z_{t,c} + \delta_4 FE_c + \epsilon_{i,c,t} \quad (4)$$

Where, as before, i identifies the individual c the country and t the survey year. As a dependent variable, $PSS_{i,c,t}$ measures the preferences over the size of the state. I only include preferences over the size of the state in areas of the state in which it competes with goods and services that the church provides. In the context of the countries analyzed, these areas are health, education, old age pensions and unemployment benefits. The higher this number is, the more spending individual i wants with respect to how much is given in country c at time t. On the right-hand side, $r_{i,c,t}$ is a dichotomous variable that takes the value one if individual i is religious and is the empirical counterpart of the type τ in the model. The variable $X_{i,t,c}$ contains some observable individual characteristics and $Z_{t,c}$ contains country-specific characteristics. Finally, I also include country fixed effects FE_c.

Table 3 contains the results of the estimations of equation (4). Columns (1) to (4) present the marginal effect of a PROBIT estimation in which $PSS_{i,c,t}$ is equal to 1 if the individual thinks the state should "spend more" or "spend much more", while it is 0 if he thinks the state should "spend less" or "spend much less" in the particular category of state spending. In column (5), OLS estimates are provided in which $PSS_{i,c,t}$ is the principal component of the answer to all 4 previous categories of spending. This number has been normalized to have a mean equal to 0 and a standard deviation of 1. In all the specifications, religious individuals have in average lower preference for additional state spending than the secular ones. These results are highly statistically significant. This is perfectly in line with the comparative statics of Proposition 2, which predicts that religious individuals should vote for a state of a smaller size in areas directly competing with the church. The results of column (5) show that being religious lowers one's preferences for state spending by approximately 7% of a standard deviation. To comprehend the magnitude of this coefficient, I compare it to the effect that income has on preferences over spending by the state on these social issues. In previous research [Ravallion and Lokshin (2000); Corneo and Grüner (2002); Alesina and Giuliano (2009)], personal and family income has been shown to be a very good predictor of preferences over the size of social spending by the state. Being religious instead of secular has approximately the same effect of increasing one's income position by one quartile (result not reported).

Finally in Table 4, I run a series of placebo regressions. In these regressions, I again estimate equation (4), studying the correlation between religiosity and preferences over the size of the state for the areas of military, law and enforcement, research and environmental protection spending. For the countries in the sample, these are areas that do not compete with the church. The results in Table 4 show that most of the correlations between religiosity

and preferences for additional public spending are positive (the only exception is public spending on environmental protection). This provides partial evidence of the fact that the negative correlation between religiosity and preferences for additional welfare previously observed is due to the competition between the goods provided by the church and specific areas of state spending.

4 Discussion and Conclusion

This paper studies the effects of competition between the state and a religious organization. What links the two institutions is the fact that the state and the church provide goods and services that answer similar needs. The mechanism explored in this paper could be present in more situations in which goods provided by the state and those provided by a non-state organization (in this paper, the church) answer similar needs. In particular, this paper shows that the rise and fall of this non-state organization is determined by government efficiency. If the state is highly inefficient, individuals vote for a small size of the state. This leaves a void that is filled by the provision of goods and services by the non-governmental organization. Finally, this cycle is reinforced by the intergenerational transmission of norms conductive to participation in the non-governmental organization (in this paper religiosity) and by endogenous destruction of state efficiency that may happen due to the existence of this non-state organization.

Examples of these other non-state organizations can be found in the Italian Mafia that provides protection in areas in which the state cannot or is not able to do so. The Mafia has been shown to have developed in order to fill the void left by the newly formed Italian state protecting the citrus sector [Dimico, Isopi and Olsson (2012)] or the sulfur industry [Buonanno et al. (2015)]. Similarly, especially in Latin America, criminal groups are dominant in many areas, as they are able to "provide better social services and public goods than the state" and "can even provide socio-economic services such as health clinics and trash disposal" [Felbab-Brown (2011)]. Examples of this can be observed in Sao Paulo's favelas, "where organized crime groups as Primero Comando da Capital also provide unofficial courts and dispute resolution mechanisms". More generally, as observed in a recent UNDP report [Wojkowska (2006)], non-state informal justice systems that compete with the formal system are wide-spread around the world. Notable examples are the sharia courts in Afghanistan that substituted formal courts after the failure of the state to provide a proper resolution mechanism [Barfield, Nojumi and Thier (2006)] or the Masai groups in Uganda that provide law and order as an informal police force [Titeca (2009)]. As noted by the UNDP report, the reasons for the emergence of these non-state justice systems are "mistrust in the formal

law, lack of understanding of the language, physically or financially inaccessibility, culturally uncomfortable or long process time". These are all instances of very low state efficiency in the provision of a formal justice system. Berman and Laitin (2008) show how many terrorists and violent groups behave as clubs, providing goods and services states are not able to provide. For example, the Taliban in Afghanistan gained popularity in the late 90s by providing security against bandits that were stopping trade to Pakistan and Iran. Hamas gained support by providing many social services that where not provided the Israeli occupational government. Hezbollah provided schools, charities and hospitals. The US Institute of Peace [Onuoha (2014)] found in a survey that almost 70% of the participants cited the Nigerian government's high rate of corruption as an important factor in the success of the terrorist group Boko Haram. As shown in Masera and Yousaf (2015), the Taliban in Pakistan has increased its support by providing flood relief and dispute resolution mechanisms where the state is not able to.

More research remains to be conducted to understand whether the mechanisms described in this paper are also able to explain these situations. Two important caveats arise with respect to applying the mechanism described in this paper to these situations of competition between state and non-state actors. First, in many of the situations described, the size of the state is decided in a non-democratic way. Nevertheless the under-provision of goods by the state may not be caused by the outcome of majority rule but rather by the decision of an elite or the ruling class. Second, in many of the situations described above, these non-state actors may use force to gain supporters and weaken the state. At the same time, the state may use violence to undermine or eliminate the non-state competitor. This adds another layer to the competition between state and non-state actor in which they compete not only through the provision of goods and services but also through the use of force.

References

Acemoglu, Daren, and James Robinson. 2012. *Why Nations Fail? The Origins of Power, Prosperity, and Poverty.*

Acemoglu, Daron, Davide Ticchi, and Andrea Vindigni. 2011. "Emergence and persistence of inefficient states." *Journal of the European Economic Association*, 9(2): 177–208.

Alesina, A, and EL Ferrara. 2005. "Ethnic diversity and economic performance." *Journal of Economic Literature*, XLIII(September): 762–800.

Alesina, Alberto, and Eliana La Ferrara. 2005. "Preferences for redistribution in the land of opportunities." *Journal of Public Economics*, 89(5-6): 897–931.

Alesina, Alberto, and George-Marios Angeletos. 2005. "Fairness and Redistribution." *The American Economic Review*, 151(3712): 867–8.

Alesina, Alberto, and Paola Giuliano. 2009. "Preferences for redistribution." In *Handbook of Social Economics*. 1–38.

Alesina, Alberto, Edward Glaeser, and Burce Sacerdote. 2001. "Why Doesn't the United States Have a European-Style Welfare State?" *Brookings Papers on Economic Activity*, 2001(2): 187–277.

Aremu, Fatai Ayinde. 2015. "Faith-Based Universities in Nigeria and the Consequences for Citizenship." *Africa Today*, 62(1): 3–28.

Barfield, Thomas J., Neamatollah Nojumi, and J. Alexander Thier. 2006. "The Clash of Two Goods: State and Non-State Dispute Resolution in Afghanistan."

Benabou, Roland, and Efe Ok. 2001. "Social mobility and the demand for Rrdistribution : The POUM Hypothesis." *Quarterly Journal of Economics*, 116(2): 447 – 487.

Benabou, Roland, and Jean Tirole. 2006. "Belief in a just world and redistributive politics." *The Quarterly Journal of Economics*, , (May): 699–746.

Bénabou, Roland, Davide Ticchi, and Andrea Vindigni. 2015. "Forbidden Fruits : The Political Economy of Science , Religion , and Growth." *American Economic Review: Paper & Proceedings*, 105(5): 346–351.

Berman, Eli. 2000. "Sect, subsidy, and sacrifice: an economist's view of ultra-orthodox Jews." *The Quarterly Journal of Economics*, 115(3): 905–953.

Berman, Eli, and David D. Laitin. 2008. "Religion, terrorism and public goods: Testing the club model." *Journal of Public Economics*, 92(10-11): 1942–1967.

Besley, Timothy, and Torsten Persson. 2011. *Pillars of Prosperity: The Political Economics of Development Clusters.*

Bisin, Alberto, and Thierry Verdier. 2010. "The Economics of Cultural Transmission and Socialization." In *Handbook of Social Economics*. 1–106.

Brollo, Fernanda, Tommaso Nannicini, Roberto Perotti, and Guido Tabellini. 2013. "The Political Resource Curse." *American Economic Review*, 103(5): 1759–1796.

Buonanno, Paolo, Ruben Durante, Paolo Vanin, and Giovanni Prarolo. 2015. "Poor Institutions , Rich Mines : Resource Curse in the Origins of the Sicilian Mafia." *Economic Journal*, 125(2010): 1–41.

Carlsson, Hans, and Eric Van Damme. 1993. "Global games and equilibrium selection." *Econometrica*, 61(5): 989–1018.

Carvalho, Jean-Paul. 2013. "Veiling." *Quarterly Journal of Economics*, 337–370.

Chaves, Mark, Shawna Anderson, and Jason Byassee. 2009. "American Congregations at the Beginning of the 21st Century."

Chen, Daniel. 2010. "Club Goods and Group Identity: Evidence from Islamic Resurgence during the Indonesian Financial Crisis." *Journal of Political Economy*, 118(2): 300–354.

Corneo, Giacomo, and Hans Peter Grüner. 2002. "Individual preferences for political redistribution." *Journal of public Economics*, 83: 83–107.

Dehejia, Rajeev, Thomas DeLeire, and Erzo Luttmer. 2007. "Insuring consumption and happiness through religious organizations." *Journal of Public Economics*, 91(1-2): 259–279.

Dimico, Arcangelo, Alessia Isopi, and Ola Olsson. 2012. "Origins of the Sicilian Mafia : The Market for Lemons."

Felbab-Brown, Vanda. 2011. "Human Security and Crime in Latin America : The Political Capital and Political Impact of Criminal Groups and Belligerents Involved in Illicit Economies." , (September).

Francis, Leslie. 1993. "Parental Influence and Adolescent Religiosity: A Study of Church Attendance and Attitude Toward Christianity Among Adolescents 11 to 12 and 15 to 16 Years Old." *The international Journal for the Psychology of Religion.*

Francis, Leslie, and Laurence Brown. 1991. "The Influence of Home, Church and School on Prayer among Sixteen-Year-Old Adolescents in England." *Review of Religious Research.*

Franck, Raphaël, and Laurence Iannaccone. 2009. "Why did religiosity decrease in the Western World during the twentieth century?"

Frankel, David, Stephen Morris, and Ady Pauzner. 2003. "Equilibrium selection in global games with strategic complementarities." *Journal of Economic Theory*, 108(1): 1–44.

Gaskins, Ben, Matt Golder, and David Siegel. 2013. "Religious Participation and Economic Conservatism." *American Journal of Political Science*, 16801.

Gill, Anthony, and Erik Lundsgaarde. 2004. "State Welfare Spending and Religiosity: A Cross-National Analysis." *Rationality and Society*, 16(4): 399–436.

Gruber, Jonathan, and Daniel M. Hungerman. 2007. "Faith-based charity and crowd-out during the great depression." *Journal of Public Economics*, 91(5-6): 1043–1069.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2003. "People's opium? Religion and economic attitudes." *Journal of Monetary Economics*, 50(1): 225–282.

Huber, John D., and Piero Stanig. 2011. "Church-state separation and redistribution." *Journal of Public Economics*, 95(7-8): 828–836.

Hungerman, Daniel M. 2005. "Are church and state substitutes? Evidence from the 1996 welfare reform." *Journal of Public Economics*, 89(11-12): 2245–2267.

Iannaccone, Laurence. 1992. "Sacrifice and stigma: reducing free-riding in cults, communes, and other collectives." *Journal of Political economy*, 100(2): 271–291.

Iannaccone, LR. 2003. "Looking backward: A cross-national study of religious trends."

Jennings, Michael. 2014. "Bridging the Local and the Global: Faith-Based Organizations as Non-state Providers in Tanzania." *In The Politics of Non-state Welfare by Melani Cammett and Lauren MacLean.*

Lichterman, P. 2008. "Religion and the Construction of Civic Identity." *American Sociological Review*, 73(1): 83–104.

Lipford, Jody. 1995. "Group size and the free-rider hypothesis: An examination of new evidence from churches." *Public Choice.*

Luttmer, Erzo, and Monica Singhal. 2011. "Culture, context, and the taste for redistribution." *American Economic Review: Economic Policy*, 3(February): 157–179.

Masera, Federico, and Hasin Yousaf. 2015. "Filling the Void: Lack of State and the Rise of the Taliban."

McCleary, Rachel, and Robert Barro. 2006. "Religion and economy." *Journal of Economic Perspectives*, 20(2): 49–72.

Morris, Stephen, and Hyun Song Shin. 2003. "Global games: theory and applications." *Econometric Society Monographs.*

Onuoha, Freedom C. 2014. "Why do youth join Boko Haram?" *United States Institute Of Peace*, , (June).

Paldam, Martin, and Erich Gundlach. 2012. "The religious transition . A long-run perspective." *Public Choice*, , (1576).

Ploeg, Frederick Van Der. 2011. "Natural Resources: Curse or Blessing?" *Journal of Economic Literature*, 49(2): 366–420.

Poole, Keith T., and Howard Rosenthal. 1984. "The Unidimensional Congress, 1919 - 84."

Poole, KT, and Howard Rosenthal. 1991. "Patterns of congressional voting." *American Journal of Political Science*, 35(1): 228–278.

Ravallion, Martin, and Michael Lokshin. 2000. "Who wants to redistribute?: The tunnel effect in 1990s Russia." *Journal of Public Economics*, 76: 87–104.

Roozen, David A. 2008. "American Congregations 2008." *Faith Communities Today.*

Scheve, Kenneth, and David Stasavage. 2006. "Religion and preferences for social insurance." *Quarterly Journal of Political Science*, , (May): 255–286.

Seay, Laura. 2013. "Effective responses: Protestants, Catholics and the provision of health care in the post-war Kivus." *Review of African Political Economy*, 40(135): 83–97.

Stegmueller, Daniel. 2010. "Who deserves help ? Religion and preferences for welfare state responsibility for different social groups."

Stegmueller, Daniel, Peer Scheepers, Sigrid Rossteutscher, and Eelke de Jong. 2012. "Support for Redistribution in Western Europe: Assessing the role of religion." *European Sociological Review*, 28(4): 482–497.

Tabellini, Guido. 2007. "Institutions and Culture." *Presidential Lecture EEA.*

Titeca, Kristof. 2009. "The Masai and miraa: public authority, vigilance and criminality in a Ugandan border town." *The Journal of Modern African Studies*, 47(02): 291.

Tompkins, Ralph Brett, and Derek Webb. 2008. "Objective Hope: Assessing the Effectiveness of Faith-Based Organizations." *Baylor Institute for Studies of Religion.*

Wojkowska, Ewa. 2006. "Doing Justice : How informal justice systems can contribute." December.

5 Appendix

5.1 Tables and Figures

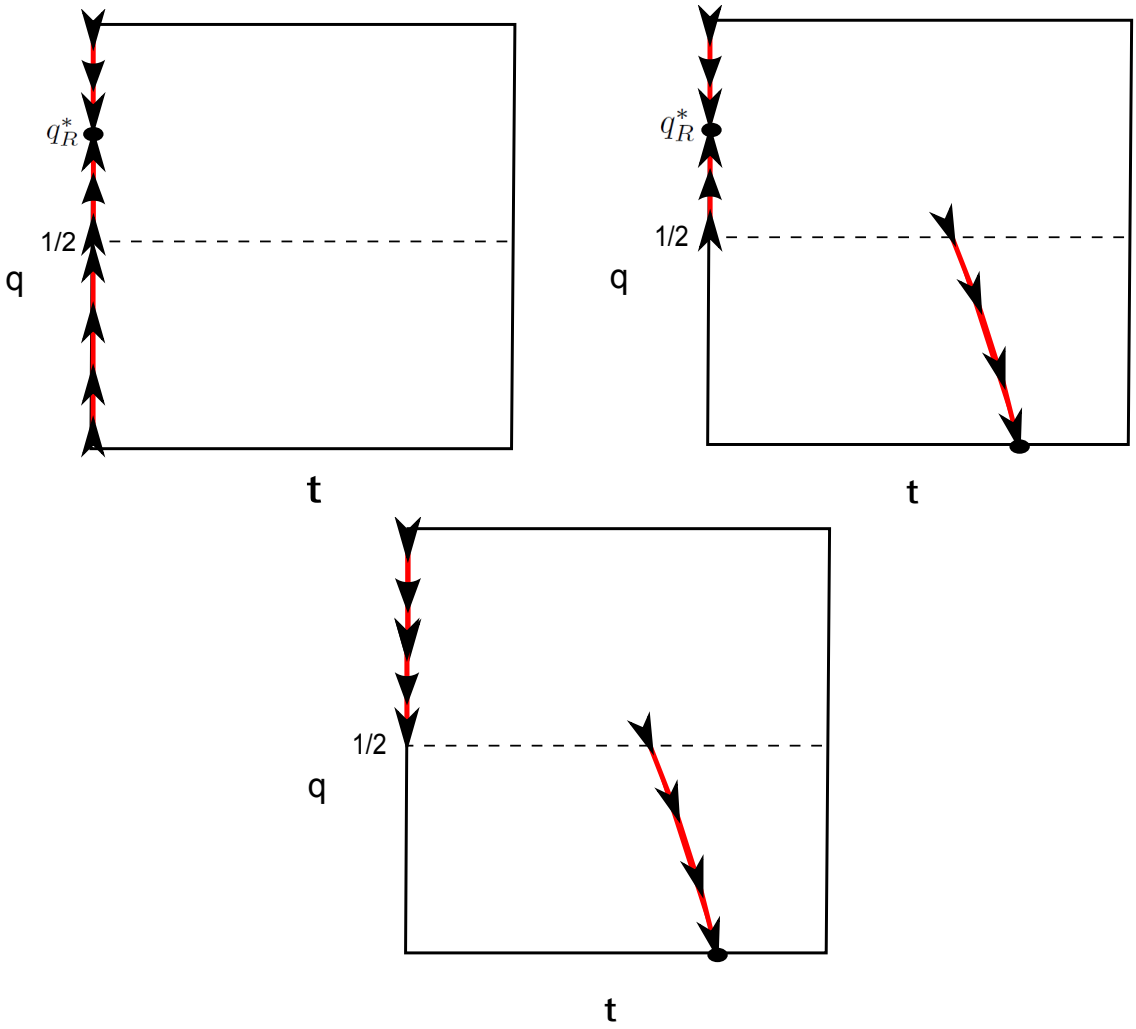


Figure 1: Top-Left: Only Religious Equilibrium, Top-Right: Secular Equilibrium and Religious Equilibrium Bottom: Only Secular Equilibrium

Table 1: Participation in Church Activities: PROBIT regression, Marginal Effects at the Mean

	(1) Basic Model	(2) Country FE	(3) Preferred
Religiosity Dummy (τ)	0.432	0.382	0.269
	(0.00693)	(0.00682)	(0.0263)
Welfare Spending (t)	-1.201	-0.692	-0.739
	(0.0409)	(0.209)	(0.210)
Welfare Spending * Religiosity			0.587
			(0.133)
Share Religious Individuals (q)		0.519	0.528
		(0.176)	(0.176)
Goverment Efficiency (α)		-0.0396	-0.0391
		(0.0171)	(0.0171)
Individual Characteristics	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Country FE	No	Yes	Yes
Observations	50890	50890	50890

Note: The table reports the PROBIT marginal effects at the mean and robust standard errors (in brackets). The dependent variable in all specification is a participation dummy that takes value one if the individual goes to church several times a year. Religiosity is a dummy that takes value one if the individual condsider himself very religious or extremely religious. Welfare Spending is the public expenditure in welfare as a percentage of GDP. Share of religious individuals is the percentage of religious individuals in a country-year. State efficiency is the first principal component of the "Government Effectiveness", "Regulatory Quality" and "Corruption" indexes with standardinzed to have zero mean and standard deviation of 1. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP and the share of religious individuals that follow the main religion.

Table 2: Participation in Church Activities: PROBIT Regression, Marginal Effects at the Mean, Placebo Regressions

	(1) Military	(2) Tertiary Education	(3) Research	(4) Non Welfare
Religiosity Dummy (τ)	0.196	0.337	0.228	0.300
	(0.0349)	(0.0338)	(0.0296)	(0.0362)
Other Government Spending	0.187	0.00675	-0.0000572	0.0254
	(0.0201)	(0.00181)	(0.0178)	(0.00232)
Other Government Spending * Religiosity	0.0200	0.00367	0.0457	0.000380
	(0.00727)	(0.00103)	(0.00801)	(0.00136)
Goverment Efficiency (α)	-0.0324	-0.0398	0.0132	-0.282
	(0.0171)	(0.0317)	(0.0210)	(0.0317)
Share Religious Individuals (q)	0.268	0.224	0.194	-1.141
	(0.179)	(0.214)	(0.283)	(0.324)
Individual Characteristics	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Observations	50890	35964	38173	36079

Note: The table reports the PROBIT marginal effects at the mean and robust standard errors (in brackets). The dependent variable in all specification is a participation dummy it takes value one if the individual goes to church several times a year. Religiosity is a dummy that takes value one if the individual condsider himself very religious or extremely religious. In column 1 government expenditure indicates the public military expenditure as a percentage of GDP as provided by SIPRI. In column 2 government expenditure indicates public expenditure in tertiary education per pupil as a percentage of GDP per capita as produced by UNESCO. In column 3 government expenditure indicates public expenditure for research and development as a percentage of GDP as produced by UNESCO. Finally in column 4 non welfare indicates the difference between total public expenses as a percentage of GDP as produced by the IMF and welfare ecxpenditure as a percentage of GDP as produced by the OECD SOCX. Share of religious individuals is the percentage of religious individuals in a country-year. Government efficiency is the first principal component of the "Government Effectiveness", "Regulatory Quality" and "Corruption" indexes standardinzed to have zero mean and standard deviation of 1. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP and the share of religious individuals that follow the main religion.

Table 3: Preference over the Size of the State: The Effects of Religiosity

	(1) Health	(2) Education	(3) Old Age Pens.	(4) Unem. Ben.	(5) PSS
Religious Dummy (τ)	-0.00527	-0.00855	-0.00199	-0.0394	-0.0722
	(0.00233)	(0.00240)	(0.00280)	(0.00631)	(0.0107)
Individual Characteristics	Yes	Yes	Yes	Yes	Yes
Country Characteristics	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	41921	38603	35455	27105	44854

Note: The table reports the estimates and robust standard errors (in brackets). The dependent variable in column (1) to (4) is a dummy that takes value 1 if the individual answer that the state should "spend more" or "spend much more" while is 0 if he think the state should "spend less" or "spend much less". The categories of spending are public health in column (1), education in column (2), old age pensions in column (3) and finally unemployment benefits in column (4). In column (5) OLS estimates are provided where the dependent variable is the principal component of the answer to all 4 previous categories of public spending. This number has to normalized to have mean equal to 0 and standard deviation of 1. Religiosity is a dummy that takes value one if the individual declares himself as religious. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job, income quartile. Country characteristics include GDP, the share of religious individuals that follow the main religion, state efficicency, voice and accountability index, political stability index, share of religious individuals.

Table 4: Preference for Additional Welfare: The Effects of Religiosity

	(1) Military	(2) Law Enforcement	(3) Research	(4) Environment	(5) Non Welfare
Religious Dummy (τ)	0.0607	0.0384	0.0123	-0.0184	0.107
	(0.00594)	(0.00474)	(0.00268)	(0.00474)	(0.0115)
Individual Characteristics	Yes	Yes	Yes	Yes	Yes
Country Characteristics	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	30970	31563	43817	31199	46030

Note: The table reports the estimates and robust standard errors (in brackets). The dependent variable in column (1) to (4) is a dummy that takes value 1 if the individual answer that the state should "spend more" or "spend much more" while is 0 if he think the state should "spend less" or "spend much less". The categories of spending are military spending in column (1), law enforcement in column (2), spending in reasearch in column (3) and finally defence of the environment in column (4). In column (5) OLS estimates are provided where the dependent variable is the principal component of the answer to all 4 previous categories of spending. This number has to normalized to have mean equal to 0 and standard deviation of 1. Religiosity is a dummy that takes value one if the individual declares himself as religious. Individual characteristics include sex, age, religious group, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP, share of religious individuals that follow the main religion, state efficicency, voice and accountability index, political stability index, share of religious individuals.

5.2 Proof of Proposition 1

First notice that given Assumption 1 - 4 religious individuals always participate in church activities. Even in the worst case scenario for a religious individual (nobody goes to church) the costs of going to church is lower than the gains. Formally:
$U_{i,R}(1,0,t) = W(\alpha f(t), [h_2(0) + h_1(0)]) - t - 1 + \lambda \ > U_R(0,0,t) = W(\alpha f(t), h_1(0)) - t \quad \forall t$
Given this result we can redefine with a slight abuse of notation the utility of a secular individuals as a function of its own participation decision (p_i), the share of secular individuals that participate (P_S) and taxation level (t).

$$U_{i,S}(p_i, P_S, t) = W(\alpha f(t), [h_1(q + (1-q)P_S) + h_2(q + (1-q)P_S)p_i]) - t - p_i$$

Following the global game procedure described in the Web Appendix the modified utility function for the secular citizens is:

$$U_{i,S}^{MOD}(p_i, P_S, t) = W(\alpha f(t), [h_1(q + (1-q)P_S) + h_2(q + (1-q)P_S)p_i]) - t - (1 + \sigma\epsilon_i)p_i$$

It can be shown that $U_{i,S}^{MOD}$ satisfies all the global game conditions found in Morris and Shin (2003) :

- A1: Action monotonicity comes directly from assumption 4
- A2: State monotonicity, A3: Strict Laplacian State monotonicity and A4: Limit Dominance come from the fact that the noise enters linearly the utility function
- A5: Continuity comes directly from the global game assumption on the distribution of ϵ_i to be continuous

Then optimal strategy for secular individuals when $\sigma \to 0$ is:

$$p_S^* = \begin{cases} 1 & if\ F(t,\alpha,q) < 0 \\ 0 & if\ F(t,\alpha,q) > 0 \end{cases}$$

$F(t,\alpha,q) = \int_0^1 W(\alpha f(t), h_2(q+(1-q)p_S) - W(\alpha f(t), h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S))dp_S + 1$

Given Assumption 2 and 3 we have:

$$\frac{\partial F(t,\alpha,q)}{\partial t} = \int_0^1 \alpha f^{'}(t)(W_1^{'}(\alpha f(t), h_2(q + (1-q)p_S) - W_1^{'}(\alpha f(t), h_2(q + (1-q)p_S) + h_1(q + (1-q)p_S))dP_S > 0$$

This already completely characterize all the equilibria and the comparative statics. In particular the fact that as t increases the relevant equilibrium passes from being $p_S^* = 1$ to $p_S^* = 0$.

Now for exposition purpose is very helpful to rewrite the results as a threshold strategy around $\hat{t}$. This will come at a cost of the introduction of a slight simplification but increase clarity in the exposition of the results.
Define $\hat{t} : \int_0^1 W(\alpha f(\hat{t}), h_2(q+(1-q)p_S) - W(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S + 1 = 0$
Given that $F(t, \alpha, q)$ is always increasing in t if $\hat{t}$ exists it is unique.
$\hat{t}$ doesn't exists under 2 scenarios:

1. Either $F(t, \alpha, q)$ is always negative. This could never happen given Assumption 2
2. Either $F(t, \alpha, q)$ is always positive. This happens when the production of the state is incredibly efficient with respect to the church. In this case, no matter what are the values of the parameters t, α, q, secular never go to church and religious individuals always go.

For the remainder of the proof case 2. is left out as it do not introduce any type of strategic decisions for the citizens as in this case their choice do not change with any of the parameters values. This simplification is also reasonable as this is a paper about competition between the state and the church and case 2. there is no competition as the efficiency state is too high for the church to matter. Readers interested also in case 2. can go back to the more cumbersome presentation of the results with the function $F(t, \alpha, q)$.
So when $\hat{t}$ now we can rewrite the optimal participation strategy as:

$$(p_S^*, p_R^*) = \begin{cases} (1,1) & if\ t < \hat{t} \\ (0,1) & if\ t > \hat{t} \end{cases}$$

Deriving this with respect to α and using implicit function theorem we get:

$$\begin{aligned} \alpha f'(\hat{t}) \frac{\partial \hat{t}}{\partial \alpha} \int_0^1 W_1'(\alpha f(\hat{t}), h_2(q+(1-q)p_S) - W_1'(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S \\ + f(\hat{t}) \int_0^1 W_1'(\alpha f(\hat{t}), h_2(q+(1-q)p_S) - W_1'(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S \quad = \quad 0 \end{aligned}$$

So given Assumption 2 and 3 $\frac{\partial \hat{t}}{\partial \alpha} < 0$

Again deriving this with respect to q and using implicit function theorem we get:

$$\alpha f^{'}(\hat{t})\frac{\partial \hat{t}}{\partial q}\int_0^1 W_1^{'}(\alpha f(\hat{t}), h_2(q+(1-q)p_S) - W_1^{'}(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S$$
$$+\int_0^1 (1-P_S)[h_2^{'}(q+(1-q)p_S)W_2^{'}(\alpha f(\hat{t}), h_2(q+(1-q)p_S) \quad -$$
$$-(h_2^{'}(q+(1-q)p_S) + h_1(q+(1-q)p_S))W_2^{'}(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)]) \quad = \quad 0$$

So given Assumption 2 and 3 $\frac{\partial \hat{t}}{\partial q} > 0$

5.3 Proof of Proposition 2

The utility function for secular individuals is:

$$U_{i,S}(t) = \begin{cases} U_{i,S}^A(t) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 & for\, t < \hat{t} \\ U_{i,S}^B(t) \equiv W(\alpha f(t), h_1(q)) - t & for\, t > \hat{t} \end{cases}$$

Defining $\ddot{t}:\ U_{i,S}^A(\ddot{t}) = U_{i,S}^B(\ddot{t})$ or
$\ddot{t}:\ R_1(t) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - W(\alpha f(t), h_1(q)) = 1$
Is useful to introduce a new function R_2 in relationship with $\hat{t}$ defined as follows
$\hat{t}: R_2(t) \equiv \int_0^1 W(\alpha f(\hat{t}), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)]) - W(\alpha f(\hat{t}), h_2(q+(1-q)p_S)dp_S = 1$
Given Assumptions 2 and 3 we have that $R_1(t) > R_2(t)$,$\frac{\partial R_1}{\partial t} < 0$ and $\frac{\partial R_2}{\partial t} < 0$ then $\ddot{t}$ exists is unique and $\ddot{t} > \hat{t}$

The utility function for religious individual is:

$$U_{i,R}(t) = \begin{cases} U_{i,R}^A(t) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 + \lambda & for\, t < \hat{t} \\ U_{i,R}^B(t) \equiv W(\alpha f(t), h_1(q) + h_2(q)) - t - 1 + \lambda & for\, t > \hat{t} \end{cases}$$

Let's first define $\tilde{t}:\ \frac{\partial U_{i,S}^A}{\partial t}(\tilde{t}) = 0$ or equivalently $\tilde{t}:\ \frac{\partial U_{i,R}^A}{\partial t}(\tilde{t}) = 0$, $\tilde{\tilde{t}}:\ \frac{\partial U_{i,S}^B}{\partial t}(\tilde{\tilde{t}}) = 0$ and $\tilde{\tilde{\tilde{t}}}: \frac{\partial U_{i,R}^B}{\partial t}(\tilde{\tilde{\tilde{t}}}) = 0$

Notice that given Assumptions 2 and 3 $\tilde{\tilde{t}} > \tilde{\tilde{\tilde{t}}} > \tilde{t}$

First I study the extreme case where $\hat{t} < 0$ or in other words even when the welfare state doesn't exist secular individuals prefer to not go to church. As in Proposition 1 this case is not particularly interesting as participation decisions of individuals do not vary with any of the other variables of the model. I still will explicitly study it as this does not provide a more cumbersome presentation of the results.
When $\hat{t} < 0$ the problem simplifies and only the second part of the utility function $(U_{i,S}^B, U_{i,R}^B)$ matters for the maximization problem and the problem can be rewritten as
$t_S^* \,\epsilon\, \text{argmax}_{t\geq 0}\, W(\alpha f(t), h_1(q)) - t$
and $t_R^* \,\epsilon\, \text{argmax}_{t\geq 0}\, W(\alpha f(t), h_1(q) + h_2(q)) - t - 1 + \lambda$

Given Assumptions 2 and 3 $t_S^* \geq t_R^*$, where it is equal when the constraint at zero binds for both maximization problems

Now I study the more interesting case where $\hat{t} > 0$ and divide the analysis in 2 sub-cases:

1. If $\frac{\partial U_{i,S}^A}{\partial t}(0) < 0$:

   We have also $\frac{\partial U_{i,R}^A}{\partial t}(0) < 0$ and given $U_{i,R}^A(t) > U_{i,R}^B(t)\ \forall t\ t_S^* = 0 \Rightarrow t_S^* \geq t_R^*$

2. If $\frac{\partial U_{i,S}^A}{\partial t}(0) > 0$

   (a) and if $\tilde{t} < \hat{t}$ and $U_{i,S}^A(\tilde{t}) < U_{i,S}^B(\tilde{\tilde{t}})$ we have $t_S^* = t_R^* = \tilde{t}$ as they are both the solution of the same maximization problem

   (b) and if $\tilde{t} < \hat{t}$ and $U_{i,S}^A(\tilde{t}) > U_{i,S}^B(\tilde{\tilde{t}})$ we have $t_S^* = \tilde{\tilde{t}} > t_R^* = \tilde{t}$

   (c) finally if $\tilde{t} > \hat{t}$ is useful to modify the utility function of a religious individual in the following way:

   $$U_{i,R}^{mod}(t) = \begin{cases} U_{i,R}^{A,mod}(t) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 & for\ t < \hat{t} \\ U_{i,R}^{B,mod}(t) \equiv W(\alpha f(t), h_1(q) + h_2(q)) - t - 1 & for\ t > \hat{t} \end{cases}$$

   Given that this is an affine transformation it has no effect in the maximization problem.

   Now notice that given the optimality of participation decision of secular individuals we have that for $t > \hat{t}:\ U_{i,S}^B(t) > U_{i,R}^{B,mod}(t)$, or in other words there are no incentive to not participate for secular individuals.

   Because of this we have 2 possibilities:

   Either $U_{i,S}^B(\tilde{\tilde{t}}) < U_{i,R}^A(\hat{t}) \Rightarrow U_{i,R}^{B,mod}(\tilde{\tilde{t}}) < U_{i,R}^A(\hat{t}) = U_{i,R}^{A,mod}(\hat{t}) \Rightarrow t_R^* = t_S^* = \hat{t}$

   Or $U_{i,S}^B(\tilde{\tilde{t}}) > U_{i,R}^A(\hat{t}) \Rightarrow t_S^* = \tilde{\tilde{t}} > t_R^*$ given that for $t > \hat{t}:\ U_{i,S}^B(t) > U_{i,R}^{B,mod}(t)$

5.4 Proof of Proposition 3

Finding t_S^*:

rewrite $U_{i,S}(t) = \begin{cases} U_{i,S}^A(t) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 & for\ t < \hat{t} \\ U_{i,S}^B(t) \equiv W(\alpha f(t), h_1(q)) - t & for\ t > \hat{t} \end{cases}$

Taking derivatives we have:

$\frac{\partial U_{i,S}^A}{\partial t}(t) = \alpha f'(t) W_1'(\alpha f(t), h_1(1) + h_2(1)) - 1 < 0$ given Assumption 5

$\frac{\partial U_{i,S}^B}{\partial t}(t) = \alpha f'(t) W_1'(\alpha f(t), h_1(q)) - 1$

Defining $\ddot{t}: U^A_{i,S}(\ddot{t}) = U^B_{i,S}(\ddot{t})$ or
$\ddot{t}: R_1(t) \equiv W(\alpha f(t), h_1(1)+h_2(1)) - W(\alpha f(t), h_1(q)) = 1$
Is useful to introduce a new function R_2 in relationship with $\hat{t}$ defined as follows
$\hat{t}: R_2(t) \equiv \int_0^1 W(\alpha f(\hat{t}), [h_2(q+(1-q)p_S)+h_1(q+(1-q)p_S)]) - W(\alpha f(\hat{t}), h_2(q+(1-q)p_S)dp_S = 1$
Given Assumptions 2 and 3 we have that $R_1(t) > R_2(t)$,$\frac{\partial R_1}{\partial t} < 0$ and $\frac{\partial R_2}{\partial t} < 0$ then we can show that it exists is unique and $\ddot{t} > \hat{t}$
Defining $\tilde{t}: \alpha f'(\tilde{t}) W_1'(\alpha f(\tilde{t}), h_1(q)) - 1 = 0$ noticing in that $\frac{\partial U^A_{i,S}}{\partial t}(t) < \frac{\partial U^B_{i,S}}{\partial t}(t)\ \forall t$ then

$$\text{Then: } t^*_S = \begin{cases} 0 & U^A_{i.S}(0) > U^B_{i,S}(\tilde{t}) \\ \tilde{t} & U^A_{i.S}(0) < U^B_{i,S}(\tilde{t}) \end{cases}$$

$$\text{or alternatively: } t^*_S = \begin{cases} 0 & S(\alpha) > 0 \\ \tilde{t} & S(\alpha) < 0 \end{cases}$$

Where $S(\alpha) \equiv W(0, h_1(1)+h_2(1)) - W(\alpha f(\tilde{t}), h_1(q)) - 1 + \tilde{t}$
Given assumption 5 then $\frac{\partial \tilde{t}}{\partial \alpha} > 0$ and is easy to show that $\frac{\partial S}{\partial \alpha} < 0$

$$\text{Then we can finally write: } t^*_S = \begin{cases} 0 & \alpha < \tilde{\alpha} \\ \tilde{t} & \alpha > \tilde{\alpha} \end{cases}$$

where $\tilde{\alpha}: W(0, h_1(1)+h_2(1)) - W(\tilde{\alpha} f(\tilde{t}(\tilde{\alpha})), h_1(q)) - 1 + \tilde{t}$

Finding t^*_R:

$$\text{rewrite } U_{i,R}(t) = \begin{cases} U^A_{i,R}(t) \equiv W(\alpha f(t), h_1(1)+h_2(1)) - t - 1 + \lambda & for\ t < \hat{t} \\ U^B_{i,R}(t) \equiv W(\alpha f(t), h_1(q)+h_2(q)) - t - 1 + \lambda & for\ t > \hat{t} \end{cases}$$

Taking derivatives we have: $\frac{\partial U^A_{i,R}}{\partial t}(t) = \alpha f'(t) W_1'(\alpha f(t), \beta h(1)) - 1 < 0$ given Assumptions 5
Notice that $U^A_{i,R}(t) > U^B_{i,R}(t)$
Then $t^*_R = 0$

5.5 Proof of Proposition 4

First we find conditions for the local stability of $p^*_S = 1$
Substituting in Definition 2 we get: $q_{g+1} = (1-(1-c)(1-b))q_g + c(1-q_g) = b(1-c)q_g + c$
So a candidate stable equilibrium is $q^* = \frac{c}{1-b+cb}$ and is stable because $b(1-c) < 1$
Proposition 1 shows that $p^*_S = 1$ when $t^* < \hat{t}$ and as shown in Proposition 2 this happens when $q > \frac{1}{2}$ or $\alpha < \tilde{\alpha}$. Because of this $q^* = \frac{c}{1-b+cb}$ is a stable equilibrium when either $q^* = \frac{c}{1-b+cb} > \frac{1}{2}$ or $\alpha < \tilde{\alpha}$.

Now we find conditions for the local stability of $p_S^* = 0$
Substituting in Definition 2 we get: $q_{g+1} = (1-(1-c)(1-b))q_g$
So a candidate stable equilibrium is $q^* = 0$ and is stable because $(1-(1-c)(1-b)) < 1$
Proposition 1 shows that $p_S^* = 0$ when $t^* \geq \hat{t}$ and as shown in Proposition 2 this happens when $q \leq \frac{1}{2}$ and $\alpha \geq \tilde{\alpha}$. Because of this $q^* = 0$ is a stable equilibrium if $\alpha \geq \tilde{\alpha}$.

5.6 Proof of Proposition 5

The strategy of this proof is to write the optimal participation strategy p_τ^* explicitly as a function of α. Then rewrite the utility functions of both religious and secular individuals as a function of α and find the optimal level for both types.
Define $\hat{\alpha}$: $\int_0^1 W(\hat{\alpha}f(t), h_2(q+(1-q)p_S) - W(\hat{\alpha}f(t), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S + 1 = 0$

Notice that:
$F(t,\alpha,q) = \int_0^1 W(\alpha f(t), h_2(q+(1-q)p_S) - W(\alpha f(t), h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S))dp_S + 1$
is increasing in α. Given this if $\hat{\alpha}$ exists then it is unique.
As in Proposition 1 the only time where $\hat{\alpha}$ doesn't exist is the uninteresting scenario where secular individuals never go to church independently of the parameters of the model. As in Proposition 1 for exposition purposes I do not report what would happen in this scenario. Is easy to see that they do not provide any interesting insight in the effects of α on any participation choice decision. In this scenario given that α has no effect on participation is easy to see that α^* for both types would be always $\bar{\alpha}$.

Now looking at the other cases we can then rewrite Proposition 1:

$$(p_S^*, p_R^*) = \begin{cases} (1,1) & if\ \alpha < \hat{\alpha} \\ (0,1) & if\ \alpha > \hat{\alpha} \end{cases}$$

The utility function for religious individual is:

$$U_{i,R}(\alpha) = \begin{cases} U_{i,R}^A(\alpha) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 + \lambda & for\ \alpha < \hat{\alpha} \\ U_{i,R}^B(\alpha) \equiv W(\alpha f(t), h_1(q) + h_2(q)) - t - 1 + \lambda & for\ \alpha > \hat{\alpha} \end{cases}$$

Notice that both functions are increasing in α and $U_{i,R}^A(\alpha) > U_{i,R}^B(\alpha)\ \forall \alpha$

Because of this $max_{\alpha\epsilon[0,\bar{\alpha}]}U_{i,R}$ has 3 types of solutions. Before going trough the 3 possible type equilibria let me define α_R such that: $\alpha_R : U^A_{i,R}(\bar{\alpha}) = U^B_{i,R}(\alpha_R)$. Given that $U^B_{i,R}$ is increasing in α and Assumption 2 then α_R exists and is unique.

1. If $\bar{\alpha} < \hat{\alpha}$ then $U^A_{i,R}$ is the only relevant part of the utility function and the optimal α is$\alpha^*_R = \bar{\alpha}$

2. If $\bar{\alpha} > \hat{\alpha}$ and $\bar{\alpha} < \alpha_R$ then given the definition of α_R the maximum is located in the part where $U^A_{i,R}$ is relevant and given that this function is increasing the optimal α is $\alpha^*_R = \hat{\alpha}$

3. If $\bar{\alpha} > \alpha_R$ then given both $U^A_{i,R}$ and $U^B_{i,R}$ are increasing and the definition of $\alpha_R$we have that the optimal α is $\alpha^*_R = \bar{\alpha}$

The utility function for secular individuals is:

$$U_{i,S}(\alpha) = \begin{cases} U^A_{i,S}(\alpha) \equiv W(\alpha f(t), h_1(1) + h_2(1)) - t - 1 & for\ \alpha < \hat{\alpha} \\ U^B_{i,S}(\alpha) \equiv W(\alpha f(t), h_1(q)) - t & for\ \alpha > \hat{\alpha} \end{cases}$$

Notice that both functions are increasing in. Now let's define $\tilde{\alpha} : U^A_{i,S}(\tilde{\alpha}) = U^B_{i,S}(\tilde{\alpha})$. Using Assumption 2 we can show that $U^A_{i,S}(\tilde{\alpha}) - U^B_{i,S}(\tilde{\alpha})$ is decreasing and because of this $\tilde{\alpha}$it exists and is unique. Furthermore notice that $\tilde{\alpha} > \hat{\alpha}$. This comes directly from the comparison of the explicit function that define these 2 thresholds.
For making the comparison more explicit let me define:

1. $\hat{\alpha} : \int_0^1 W(\hat{\alpha} f(t), h_2(q+(1-q)p_S) - W(\hat{\alpha} f(t), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S + 1 = 0$

2. $\tilde{\alpha} :\ W(\tilde{\alpha} f(t), h_1(q)) - W(\tilde{\alpha} f(t), h_1(1) + h_2(1)) + 1 = 0$

Define $F_1(\alpha) = \int_0^1 W(\alpha f(t), h_2(q+(1-q)p_S) - W(\alpha f(t), [h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S)])dp_S + 1$ and $F_2(\alpha) = W(\alpha f(t), h_1(q)) - W(\alpha f(t), h_1(1) + h_2(1)) + 1$ then we can notice that $F_2(\alpha) > F_1(\alpha)\ \forall \alpha > 0$ and both function are increasing in α. Then we can conclude that, as stated before, $\tilde{\alpha} > \hat{\alpha}$. With this information the problem results very similar to the one of the religious individual. In particular because of this $max_{\alpha\epsilon[0,\bar{\alpha}]}U_{i,S}$ has 3 types of solutions. Before going trough the 3 possible type equilibria let me define α_R such that: $\alpha_R : U^A_{i,S}(\bar{\alpha}) = U^B_{i,S}(\alpha_S)$. Given that $U^B_{i,S}$ is increasing and Assumption 2 then α_R exists and is unique.

1. If $\bar{\alpha} < \hat{\alpha}$ then $U^A_{i,S}$ is the only relevant part of the utility function and the optimal α is $\alpha^*_S = \bar{\alpha}$

2. If $\bar{\alpha} > \hat{\alpha}$ and $\bar{\alpha} < \alpha_S$ then given the definition of α_S the maximum is located in the part where $U^A_{i,S}$ is relevant and given that this function is increasing the optimal α is $\alpha^*_S = \hat{\alpha}$

3. If $\bar{\alpha} > \alpha_S$ then given both $U^A_{i,S}$ and $U^B_{i,S}$ are increasing and the definition of $\alpha_S$we have that the optimal α is $\alpha^*_S = \bar{\alpha}$

Now is just left to prove that $\alpha_S \leq \alpha_R$.

First compare the definition of α_S and α_R :

1. $\alpha_S : W(\hat{\alpha}f(t), h_1(1) + h_2(1)) = W(\alpha_S f(t), h_1(q)) + 1$

2. $\alpha_R : W(\hat{\alpha}f(t), h_1(1) + h_2(1)) = W(\alpha_R f(t), h_1(q) + h_2(q))$

Given $W' > 0$ for proving that $\alpha_S \leq \alpha_R$ we just need to prove that $W(\alpha f(t), h_1(q)) \geq W(\alpha f(t), h_1(q) + h_2(q)) - 1$. Notice that from the definition of α_S and α_R we have that $\alpha_S and \alpha_R > \hat{\alpha}$ then in our region of interest $\int_0^1 W(\alpha f(t), h_2(q+(1-q)p_S) - W(\alpha f(t), h_2(q+(1-q)p_S) + h_1(q+(1-q)p_S))dp_S + 1 > 0$. Using this information and assumption 5 we get that $W(\alpha f(t), h_1(q)) \geq W(\alpha f(t), h_1(q) + h_2(q)) - 1$.

5.7 Data

The merged 1991, 1998 and 2008 waves of the ISSP comprise data for 38 countries that total 66,000 observations (more than 50,000 coming from OECD countries). To identify the religiosity of an individual, I use the following question: "Would you describe yourself as..." ("Extremely non-religious", "Very non-religious", "Somewhat non-religious", "Neither religious nor non-religious", "Somewhat religious", "Very religious" or "Extremely religious"). The question "How often do you attend a religious service?" ("Never", "Less frequently than once a year", "Once a year", "Several times a year", "Once a month", "2-3 times a month", "Once a week" or "Several times a week") is used as a measure for participation in church activities. Table 5 presents the complete list of countries. In the second column of Table 5, the high heterogeneity of the average participation in church activities is shown. There are countries such as Finland in which only 21% of the citizens are regular church-goers [5], while in the Philippines, 88% of the population regularly goes to church. High levels of heterogeneity are also observed in total welfare expenditure as percentage of GDP. Mexico spends approximately 7% of their GDP, while many Northern European and Central European countries spend more than 4 times as much, with countries such as France spending approximately 30% of the GDP on welfare. Additionally, redistribution levels are widely heterogeneous. Countries such as Sweden reduce the Gini coefficient by 0.22 points using taxes and transfers, while countries such as Croatia even increase it. The most represented main religion is Catholicism, with 47% of the observations, 28% of the observations come from countries without a main religion[6].

I also use the ISSP "Role of the Government" surveys conducted in 1990, 1996 and 2006 for data on the preferred size of the state. These are a collection of different international surveys from 32 countries on the opinions held by individuals about the role of the state. For identifying preferences over the size of the state, I use the following question: "Listed below are various areas of government spending. Please show whether you would like to see more or less government spending in each area. Remember that if you say "much more", it might require a tax increase to pay for it". The possible answers are "Spend much more", "Spend more", "Spend the same as now", "Spend less" or "Spend much less". The state spending areas in developed countries that are more closely related to goods and services provided by the church are health, education, old age pensions and unemployment benefits. Table 6

[5] A regular church-goer is defined as an individual that answers the question "How often do you attend a religious service?" with several times a year or more. Robustness of the results to this definition is provided later in the paper.

[6] A country has no main religion if out of the religious population no religion denomination has more than 70%

Table 5: Summary Statistics

Country	% Church	% Religious	% Welfare	Redistribution	Gov Eff
Australia	30.2	41.9	15.9	0.24	0.73
Austria	51.6	55.2	25.4	0.36	0.84
Belgium	28.8	50.1	26.7	0.20	0.37
Chile	63.3	51.3	10.7	0.03	0.33
Croatia	74.9	76.6	.	-0.03	-0.88
Cyprus	83.9	75.2	.	0.33	0.29
Czech Republic	29.7	21.4	17.9	0.34	-0.34
Denmark	30.6	22.8	26.2	0.47	1.30
Dominican R.	79.7	68.5	.	0.04	-1.94
Finland	20.8	38.1	24.3	0.41	1.13
France	24.1	28.3	29.2	0.39	0.35
Germany	35.6	32.8	24.5	0.40	0.75
Hungary	33.6	40.1	23.1	0.34	-0.31
Ireland	83.2	69.7	18.0	0.25	0.80
Israel	46.7	35.6	16.1	0.21	0.10
Italy	64.9	66.0	23.6	0.26	-0.53
Japan	48.6	25.3	17.3	0.15	-0.04
Latvia	42.2	34.8	.	0.30	-0.72
Mexico	76.6	69.4	7.2	0.05	-1.20
Netherlands	37.3	35.4	22.4	0.33	1.12
New Zealand	34.6	38.3	20.4	0.13	1.13
Norway	19.2	36.7	22.1	0.41	0.93
Philippines	88.5	83.9	.	0.01	-1.41
Poland	86.8	79.8	20.6	0.29	-0.55
Portugal	70.0	72.0	19.6	0.32	0.07
Russia	13.5	29.4	.	0.14	-2.11
Slovakia	59.3	57.7	17.0	0.31	-0.59
Slovenia	52.4	37.5	21.5	0.31	-0.06
South Africa	77.1	78.3	.	0.06	-0.83
South Korea	48.7	42.8	8.2	0.10	-0.43
Spain	63.3	50.1	21.6	0.23	0.23
Sweden	31.1	15.3	28.6	0.47	0.96
Switzerland	46.0	39.4	18.0	0.26	1.06
Turkey	79.5	87.6	11.1	0.07	-1.09
Ukraine	61.9	64.6	.	0.16	-2.18
United States	59.8	73.1	15.0	0.20	0.67
Uruguay	25.9	31.6	.	0.11	-0.61
Venezuela	69.7	70.4	.	0.05	-2.88

Note: % church is the share of individuals that goes to church several times a year, % religious is the share of religious individuals in a country. % Welfare is the share of the GDP spend in social services as measured by SOCX. Redistribution measures the difference in pre and post taxes Gini income index. Gov Eff is an index that measures the state effectiveness of the country as measured by the World Bank.

presents the list of countries and some of the country characteristics.[7]

I control for many observable individual characteristics. In particular, I control for the following: sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked and whether the person supervises somebody at their job. Furthermore, family income is used to identify the income quartile of each individual. All data comes from the ISSP surveys. At the country level, I control for the log of the GDP per capita.

As a measure for the size of the state, I use the Social Expenditure dataset (SOCX) by the OECD, which presents the public social expenditure as a percentage of GDP. Public social expenditure is defined as follows: "The provision by public institutions of benefits to, and financial contributions targeted at, households and individuals in order to provide support during circumstances which adversely affect their welfare". For the OECD countries in this dataset, these are goods and services that answer needs similar with respect to the ones provided by religious organizations.

Unfortunately, the SOCX welfare state measures are available only for OECD countries. Because of this, I also use an alternative measure of services provided by the states that is in competition with the church and is available for all the countries in my sample. This measure is the difference between the pre-tax and post-tax Gini income coefficients as produced by the Standardized World Income Inequality Dataset (SWIID), developed in Solt (2009): *Standardizing the World Income Inequality Database*, Social Science Quarterly,. This measure captures the degree to which the state redistributes income between individuals. In an indirect way, churches are also trying to redistribute money across citizens by making rich individuals who participate in church activities pay donations that finance services specifically targeted at the poor.

Finally, as a measure of the amount and quality of the goods provided by the state, I control for indicators of state effectiveness, regulatory quality and corruption constructed by the World Bank.[8].

[7] In the 1990, 1996 and 2006 ISSP waves the question "Would you describe yourself as..." ("Extremely non-religious", "Very non-religious", "Somewhat non-religious", "Neither religious nor non-religious", "Somewhat religious", "Very religious", or "Extremely religious") is not available. To identify whether the individual is religious, the following question is used: "Do you belong to a religion? If yes, to which one?", and you are considered religious if you answer yes. Using this question to identify religiosity tends to overestimate the level of religiosity compared to the measure used in the ISSP waves of 1991, 1998 and 2008.

[8] The World Bank Governance indicators are available beginning in 1996. Because of this, I impute the 1996 value of the governance indicator to observations before 1996.

Table 6: Summary Statistics

Country	% Religious	% M Health	% M Educ.	% M Pension	% M Unem.
Australia	78.1	95.7	97.1	93.2	19.1
Bulgaria	99.6	99.1	98.4	97.6	89.7
Canada	84.7	93.0	94.8	84.1	45.3
Chile	88.6	99.4	98.9	99.1	95.6
Croatia	92.9	98.5	99.0	98.9	91.1
Cyprus	100.0	99.0	99.0	93.3	82.0
Czech Republic	47.6	96.5	94.4	94.0	32.8
Denmark	88.1	98.8	97.9	93.4	49.8
Finland	83.7	98.1	91.6	97.7	68.8
France	63.2	85.1	88.5	82.1	30.9
Germany	76.9	92.7	91.6	92.9	71.4
Hungary	93.2	99.2	98.4	97.9	60.5
Ireland	96.9	98.9	98.2	99.6	81.1
Italy	94.8	94.3	94.2	93.5	72.8
Japan	37.6	89.3	89.8	91.2	68.3
Latvia	60.2	99.4	99.0	99.2	83.1
Netherlands	60.9	97.2	98.2	87.4	25.0
New Zealand	69.8	98.7	99.0	93.3	13.3
Norway	91.0	98.7	95.6	97.8	46.6
Poland	92.1	98.8	98.5	98.6	74.3
Portugal	92.8	99.5	99.0	99.3	86.4
Russia	72.5	99.1	99.0	99.0	87.7
Slovenia	77.1	97.6	98.1	91.5	70.3
South Africa	85.5	97.5	96.5	95.7	90.6
South Korea	60.1	97.7	90.8	94.5	79.8
Spain	81.6	99.0	99.1	98.6	89.4
Sweden	77.0	98.3	94.5	95.4	64.2
Switzerland	87.5	73.3	92.0	88.1	55.6
United States	88.3	92.6	95.3	85.0	61.7
Uruguay	74.2	98.0	98.7	97.4	90.2
Venezuela	86.3	95.0	96.6	97.9	91.4

Note: % Religious is the share of religious individuals in a country. % M health is the percentage of individuals that want more spending in health services by the state. % M Educ. is the percentage of individuals that want more spending in educational services by the state. % M Pension is the percentage of individuals that want more spending in old age pensions. % M Unem is the percentage of individuals that want more spending in unemployment benefits.

5.8 Robustness Checks

As a robustness check in Table 7, I run a set of alternative regressions. In column (1), the definition of being religious is relaxed to include also individuals who declare themselves to be "somewhat religious". In column (2), the participation dummy is changed to include only individuals who go every month to church. Finally, in column (3), equation (3) is estimated as a linear probability model. Qualitatively, most of the results remain unchanged.

Additionally, in Table 8, the same regression specification as in equation (**??**) is estimated; However, instead of using the OECD welfare state measure, I use the redistribution measure as defined by SWIID. This also expands my sample to observations from non-OECD countries. All results are confirmed and remain highly significant. Again, all the correlations are in line with the comparative statics of Proposition 1 even though more countries have been included. Looking at size of these correlations, we can see how a one standard deviation increase in the distance between pre- and post-tax Gini indexes implies a 10.5 percentage point decrease in the probability of participating in church activities for secular individuals while only decreasing 2.5 percentage points for religious individuals.

Table 7: Participation in Church Activities: PROBIT regression, Marginal Effects at the Mean

	(1) Alt. Religiosity	(2) Alt. Participation	(3) Linear Probability Model
Religiosity Dummy (τ)	0.340	0.132	0.187
	(0.0144)	(0.0184)	(0.0196)
Welfare Spending (t)	-0.594	-0.485	-0.685
	(0.205)	(0.180)	(0.201)
Welfare Spending * Religiosity	0.161	1.017	0.876
	(0.0698)	(0.0940)	(0.100)
Goverment Efficiency (α)	-0.0600	0.00283	-0.0443
	(0.0159)	(0.0160)	(0.0185)
Share Religious Individuals (q)	-0.0223	-0.354	0.596
	(0.0701)	(0.149)	(0.176)
Individual Characteristics	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Observations	50890	50890	50890

Note: The first 2 columns of the table reports the PROBIT marginal effects at the mean. The last column reports the OLS estimates. Robust standard errors are found in the brackets. The dependent variable Column 1 and 3 is a participation dummy. It takes value one if the individual goes to church several times a year. In Column 2 an alternative definition of church participation is included where it takes value one if the individual goes to church once a month or more. In Column 2 and 3 Religiosity is a dummy that takes value one if the individual condsider himself very religious or extremely religious. In Column 1 religiosity takes value 1 if the individual condsider himself somewhat religious or more. Welfare Spending is the public expenditure in welfare as a percentage of GDP. Share of religious individuals is the percentage of religious individuals in a country-year. state efficiency is the first principal component of the "Government Effectiveness", "Regulatory Quality" and "Corruption" indexes standardinzed to have zero mean and standard deviation of 1. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP and the share of religious individuals that follow the main religion.

Table 8: Participation in Church Activities: PROBIT regression, Marginal Effects at the Mean, Redistribution

	(1) Basic Model	(2) Country FE	(3) Preferred
Religiosity Dummy (τ)	0.384	0.331	0.202
	(0.00551)	(0.00546)	(0.0101)
Redistribution	-0.578	-0.724	-0.755
	(0.0145)	(0.103)	(0.103)
Redistribution * Religiosity			0.591
			(0.0415)
Share Religious Individuals (q)		0.664	0.663
		(0.138)	(0.138)
Goverment Efficiency (α)		-0.0760	-0.0771
		(0.0161)	(0.0161)
Individual Characteristics	Yes	Yes	Yes
Time FE	Yes	No	No
Country FE	No	Yes	Yes
Observations	66484	66484	66484

Note: The table reports the PROBIT marginal effects at the mean and robust standard errors (in brackets). The dependent variable in all specification is a participation dummy that takes value one if the individual goes to church several times a year. Religiosity is a dummy that takes value one if the individual declares himself as religious. Redistribution is the difference between the Gini coefficient before and after taxes. Share of religious individuals is the percentage of religious individuals in a country-year. state efficiency is the first principal component of the "Government Effectiveness", "Regulatory Quality" and "Corruption" indexes standardinzed to have zero mean and standard deviation of 1. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP and the share of religious individuals that follow the main religion.

5.9 Empirical Evidence of the Intergenerational Transmission of Religiosity

As evidence of the intergenerational transmission of religious values I study retrospective questions found in the ISSP dataset of 1991, 1998 and 2008. The ISSP is a compilation of cross-country surveys across 38 countries that in those waves asked about information on the religious lives of the individuals and their families. The survey asks about your religiosity now that you are an adult and some retrospective questions about the type of family you were raised in. In particular, if you were raised in a religious fashion and if your parents went to church when you were a kid. Your religiosity as an adult is positively correlated to being raised in a religious family (corr = 0.26) and that your parent went to church when you were a kid (corr = 0.33). More formally, I can use this information to identify if there is any statistical relationship between religiosity as and adult and religiosity and church participation decision estimating the following regression:

$$Prob(r_{i,c,t} = 1) = \phi(\beta_1 parents\, rel_{i,c,t} + \beta_2 parents\, part_{i,c,t} + \beta X_{i,c,t} + \epsilon_{i,c,t} > 0)$$

Where i identifies the individual, c the country and t the time. On the left-hand side $r_{i,c,t}$ is a dummy variable that takes value 1 if the individual describes itself as very or extremely religious nowadays. On the right-hand side, *parent rel* and *parent part* are respectively a dummy variable that takes value 1 if you where raised in a religious home and when the individual was a kid at least one parent participated in religious activities regularly. Results are reported in Table 9. Even controlling for many observables, being raised in a religious family and having parents that participated in church activities is always positively correlated with being religious as an adult. Being raised in a religious family in average increases probability of being religious as an adult by 8 percentage points (an increase of 55%) and having a parent that went to church when you where a kid by 3 percentage points (an increase of 20%).

Table 9: Religiosity as an adult: PROBIT regression, Marginal Effects at the Mean

	(1) Basic Model	(2) Individual Char.	(3) Country Char.
Raised Religious	0.136	0.0848	0.0818
	(0.00437)	(0.00651)	(0.00758)
Parent Church	0.134	0.0311	0.0290
	(0.00311)	(0.00407)	(0.00435)
Individual Characteristics	No	Yes	Yes
Country Characteristics	No	No	Yes
Time FE	No	Yes	Yes
Country FE	No	No	Yes
Observations	102567	63264	48705

Note: The table reports the PROBIT estimates and robust standard errors (in brackets). The dependent variable in all specification is a religious dummy that takes value 1 if the individual declares to be religious. Raised Religous takes value 1 if you where raised in a religious home. Parent Church takes value 1 if when the individual was a kid at least one parent participated in religious activities regularly. Individual characteristics include sex, age, marital status, work status, education degree, size of the household, type of occupation, hours worked, if you supervise somebody at the job and income quartile. Country characteristics include GDP, share of religious individuals that follow the main religion, state efficicency, share of religious individuals and welfare state expenditure as a percentage of GDP. All the regressions are run with individuals that are 20 years or older.

5.10 Global Game Methodology

For implementing the global game methodology I introduce some noise in the cost of participation to church. This leads to the following modified payoff function.

$$U_{i,\tau}^{MOD}(p_i, P, t) = W(\alpha f(t)\ ,\ h_1(P) + h_2(P)\, p_i) - t - (1 + \sigma\epsilon_i)p_i + \lambda_\tau p_i$$

Where the only difference with the original utility function is that each individual has an idiosyncratic cost of participation to church $1 + \sigma\epsilon_i$. Each individual only observes their own idiosyncratic cost of participation. For deciding whether or not to participate in church activities citizen i needs to predict the share of individuals that participate in church activities. The reason is that the decision of participating or not to church of another citizen j will depend on the idiosyncratic cost of participation (x_j). The main assumption of the global game methodology is that from the point of view of citizen i x_j is a random variable that has the following shape $x_j = \theta + \sigma\epsilon_j$ where θ follows an improper uniform and ϵ_j follows a continuous distribution. The improper uniform assumption states that citizens are completely uniformed about where θ is located. In other words, given the improper uniform prior on θ, observing $x_i = 1 + \sigma\epsilon_i$ gives the citizens no information on their ranking within the population of signals. As the noise goes to zero ($\sigma \to 0$), and we approach the original problem, a unique strategy survives iterated deletion of dominated strategies.

The Charitable Terrorist: State Capacity and the Support for the Pakistani Taliban

Federico Masera, Hasin Yousaf

Abstract

Violent, criminal or terrorist organizations are often also providers of many social services. In this paper we show how the capacity of the state of providing similar social services may influence the support for these organizations. We do so by studying how the support for the Pakistani Taliban changed after two natural disasters: an earthquake in 2005 and a flood in 2010 which received different levels of international help. While the earthquake took place at a time when Pakistan was a close ally of the United States and it received extensive international aid, the flood occurred at a time when Pakistan-U.S. relations had deteriorated and consequently it received insufficient funds. Support for the Taliban decreased in the areas affected by the earthquake, while it increased in the areas affected by the flood. This shows how a lack of state capacity may leave a void that can be then filled by the Taliban. We then show how alternate explanations such as anger against the incumbent for poor performance and political substitution among non-incumbent political groups can not account for these results.

1 Introduction

The Pakistani Taliban are often providers of goods and services close to what you would expected the formal Pakistani state to provide. They provide schools, hospitals, a legal system and a parallel police system to enforce these rules. Many other violent, criminal or terrorist organizations around the world behave in a similar fashion by competing with the state in the provision of many social services. For example, criminal organizations in Latin America, maintain the public goods infrastructure of the most disadvantaged parts of many cities by building roads, maintaining the water distribution system and trash disposal. Around the world mafias are often providers of security and a resolution mechanism, especially in areas where the state is not present. Closer to the Pakistani case, in many majority Muslim countries many violent religious groups provide goods and services as a parallel state. For example, in the Middle East, groups like Hamas in Palestine, the Muslim Brotherhood in Egypt and Hezbollah in Lebanon are providers of many social services. More recently, violent groups, like Boko Haram in Nigeria and ISIS in Syria and Iraq, immediately recreate many of the institutions that provide goods and services when they take control of new territory.

In this paper we empirically study how state capacity may influence the rise and fall of these types of organizations. For doing so we focus on the competition between the Pakistani state and the Taliban in the provision of natural disaster relief. Both these actors provide, immediately after a natural disaster, food, water and medicine. In the long-run, they are both involved in the reconstruction process and provide a legal system to resolve the many disputes, often land-related, that arise after a natural disaster.

In this paper we empirically test in the Pakistani context how state capacity can affect the rise and fall of these violent organizations. The mechanism that is proposed and tested is the following: In the case of insufficient state capacity the needs of people are not taken care by formal state institutions. This leaves a void that can be filled by a non-state group, in our case the Taliban. This then leads to an increase in the popular support for this non-state group. To the contrary, if state capacity is sufficient, the state is able to provide for people. This crowds-out the terrorist organization leading to a decline in its popular support.

This hypothesis is generally difficult to test without a clean source of exogenous variation. In this paper we overcome this problem by using a Difference-in-Difference (DiD) empirical strategy for two natural disasters that occurred at times were the capacity of the state in providing natural disaster relief were substantially different. For each natural disaster we then compare the popular support for the Taliban before and after a natural disaster, between places that were affected or not by a natural disaster. As a proxy for popular support for the Taliban we exploit the fact that in Pakistan the Taliban ideology is politically represented by

the Muttahida Majlis-e-Amal (MMA) party. This provides us with a particularly accurate measure of the support for the Taliban at a very small geographical unit for every election year.

The natural disasters we consider are the two biggest that stroke Pakistan in the last decades. An earthquake in 2005, the biggest earthquake in the modern history of Pakistan. This natural disaster happened in a period where Pakistan was an essential partner in the war-on-terror in Afghanistan and Iraq. Because of this Pakistan received a high levels of international aid and the government had extensive capacity of providing relief to all the people affected by the natural disaster. We then consider the 2010 floods in which more than one-fifth of the land was under water and more than 20 million people were affected. This natural disaster instead happened in a period of deteriorated relationship between the US and Pakistan. This is due to many factors that include, a change in the presidency of the US and Pakistan, the use of unauthorized drone attacks in the Pakistani territory and the presence of many high-caliber terrorist (most famously Bin Laden) in Pakistan. Because of these reasons the international aid response was inadequate and slow to arrive which exacerbated the already desperate situation created by the flood.

We explore the effects of these natural disasters on the electoral results of the MMA party for the national elections of 2002, 2008 and 2013. We find that the areas exposed to the 2005 earthquake, that happened in period of high state capacity, saw a substantial decrease in the support for the MMA in the subsequent elections. Electoral districts affected by the flood of 2010, that instead happened in a period of lack of state capacity, displayed exactly the opposite behavior, with an increase in the votes for the MMA. In the preferred specification, the areas affected by the 2005 earthquake witnessed a decrease of 11 percentage points in the vote share for the MMA compared to the areas which were not affected. Instead electoral districts affected by the 2010 flood witnessed an increase of 3 percentage points in the vote share for the MMA compared to the areas which were not affected. These are big changes for the MMA given that in the time period studied their average result is of 12 percentage points. These numbers are also considerable when taking into account that in an average national Pakistani election 36 million citizens vote. This shows that state capacity can move preferences of millions of voters away from supporting a terrorist organization like the Taliban.

To highlight the importance of the proposed mechanism, we then use data on the percentage of funding which was unmet five months after the onset of the 2010 floods. We employ similar DiD approach to identify the effect of this funding gap on the support for the MMA. To alleviate endogeneity concerns, we instrument funding gap with the electoral district intensity of exposure to the flood and the distance from the provincial capital. We

show that the areas with higher funding gap had a higher increase in the vote share of Taliban parties. A 10 percentage point increase in the funding gap leads to a 0.6 percentage points increase in the vote share of the Taliban parties.

One alternative explanation with respect to the hypothesis we are putting forward is of a model of political competition were votes for the incumbent party and its competitors are affected by the performance of the government. We show that the results are not in line with this explanation. The incumbent party indeed won political support after the 2005 earthquake and lost after the 2010 floods but not significantly more in the affected areas. The main competitors to the incumbent party also observe no particular change in the political results in places affected by the earthquake or the flood. The only competitor to the incumbent party that show significant changes specifically in places affected by the natural disasters is the MMA. This again seems indicate that these effects are due to the fact that the MMA, through the Taliban, are the only party that was directly providing goods and services in competition with the state.

In all our preferred specifications we control for two important factors that may influence the changes we observe in the MMA vote share and are correlated with being affected by a natural disaster. The first factor is the Pashtun ethnicity of an electoral district. This ethnicity is historically closely connected with the Taliban. Because of this trends in the MMA vote share can be extremely different in majority Pashtun areas with respect to other electoral districts. At the same time majority Pashtun areas have been especially affected both by the flood and the earthquake. Because of this in our preferred estimation we let majority Pashtun electoral districts have different trends with respect to the other districts for the identification of the effect of the natural disaster we then use only the fact that some of them were affected by the natural disaster while others not. The results are then not driven by the Pashtun ethnicity of an electoral district but presumably only being affected by the natural disaster. The second factor we control for is only relevant for the 2010 flood and is the ex-ante propensity of floods in an electoral district. Not controlling for this factor can be a problem because people living in a place with high propensity of floods can have very different political preferences. One of the main reasons is that electoral districts that are regularly flooded base their economy on agriculture and potentially have very different voting patterns with respect to urban voters. Added to this, places that generally are prone to be affected by floods were almost certainly affected by the 2010 floods. Because of this reason we let trends in MMA votes be different depending on the historical propensity of receiving floods and only use the fact that some places with the same propensity of floods got affected by the 2010 one while others not. In other words we consider the 2010 flood a random shock after controlling for the ex-ante propensity of floods in a certain electoral

district.

Finally, for the 2010 flood we provide evidence of the validity of our identification strategy exploiting the availability of two pre-treament elections. For the DiD estimation we conduct causal estimation is dependent on the parallel trends assumption. That is, in the absence of the flood, the areas which were unaffected by the flood would have evolved in the same way as the areas which were exposed to the flood. Since, we have two pre-flood periods, we can indirectly test this assumption by studying the MMA vote trends before the flood. That is, the areas which were affected by the flood in 2010 had similar change in the support for the Taliban between 2002 and 2008, compared to the areas which were not flooded in 2010. This strengthens that what we find is indeed a causal effect of flood on the support for Taliban.

This paper is closely related to the literature that studies the causes of civil conflict, war and terrorism (for a review of the literature refer to Blattman and Miguel (2010). These causes may be ethnic differences (Esteban and Ray, 2011; Esteban, Mayoral and Ray, 2012), extreme climate conditions (for a review Hsiang, Burke and Miguel (2013)), political instability (Fearon and Laitin, 2003), rise in international price shocks (Besley and Persson, 2008; Dube and Vargas, 2013) among many others.

More closely related to our paper there have been some recent studies exploring the effect of aid on conflict and violence. For example Berman, Shapiro and Felter (2011) study a model of competition between a government providing reconstruction program and violent rebels. They then test the model using panel data from Iraq and find that reconstruction spending reduces insurgent violence. Other papers have tried to identify, causally, how different forms of international aid affect conflict. Examples of this are Beath, Christia and Enikolopov (2012) that use a randomized controlled trial, Crost, Felter and Johnston (2014) using a regression discontinuity approach while Nunn and Qian (2014) uses an instrumental variable approach. They all have identified that development aid has either no effect or a detrimental effect on civil conflict. This reduced form approach to studying this problem has brought very interesting results but one existing gap in this literature comes from the fact that the connection between aid and violence is still a black box and is not clear which is the mechanism that links both of them. As suggested by Crost, Felter and Johnston (2014) then the increase of conflict could be a violent response to a decrease in support of insurgents caused by development aid. The literature, however, has not analyzed the effect of aid on the support of terrorist organizations. In particular, we are the first ones to the hypothesis that a lack a state capacity can lead to an increase popular support for a terrorist organization. We exploit the unique political setup of Pakistan in which we can possibly directly observe the political support for Taliban.

Additionally, we contribute to the literature that tries to understand the support for

terrorist or rebel groups. A very detailed review is provide by de Mesquita (2008). Some more recent works that have dealt with this issue are Jaeger et al. (2012) that shows how radicalization of the Palestinian population is influenced in the short-run by Israeli violence while in the long run by major political events like the Oslo negotiations or the first Intifada. Berman et al. (2011) find no evidence of the opportunity-cost theory that states that only individuals with a low opportunity-cost (unemployed, poor) will rebel more and use violence. Similarly Blair et al. (2013) find that the income has no link to personal support for militant and terrorist organizations. In a study in Iraq instead Iyengar, Monten and Hanson (2011) find a positive correlation at the district level between spending in labor-creating projects by the US military and violence reduction. In this paper we try to causally identify a mechanism similar in nature to Berman and Laitin (2008) that see the support terrorist groups as a way of receiving local public goods when neither the government or the markets can deliver it.

More broadly our paper also contributes to the literature that studies the effects of natural disasters and aid relief. A comprehensive discussion on the topic can be found in Stromberg (2007). For example it has been shown that international aid delivery (or the lack of) may have economic and political consequences (Alesina and Dollar, 2000). In particular, Drury, Olson and Belle (2005) show that large disasters if not handled properly by the international community may destabilize local governments. More closely related to the effects of natural disasters on terrorism Berrebi and Ostwald (2011) show in a cross-country comparison that natural disasters are positively associated with terrorist attacks. Looking specifically at Pakistan, Fair et al. (2013) show how people more harshly affected by the 2010 flood in Pakistan increased their turnout to elections, had more political knowledge and they were more demanding towards the government.Andrabi and Das (2010) show a positive effects of the 2005 Pakistan earthquake on trust towards foreigners cause by a prompt delivery of foreign aid. What we do here is study the potential use of international aid relief against terrorism and radicalization of the population. We contribute to the literature by testing why natural disasters could be related with terrorism. We show how the terrorist organizations can gain support by helping people after the natural disaster.

In the following section, we present the detailed background of the context with focus on the electoral system of Pakistan, a description of the natural disaster and the relief provided by the state and the data sources. In Section 3 we outline our empirical methodology. In section 4, we provide the baseline results, along with the mechanisms that could account for the results and demonstrate the heterogeneity of the results. We carry out robustness checks in the Section 5, and discuss and conclude in Section 6.

2 Context

In this section we briefly discuss the context of our setting and the data sources. Specifically, in the first subsection, we give an overview of the political system of Pakistan, providing summary of the elections, major political parties and the Islamic parties. Then, we present summary of the earthquake of 2005 and the flood of 2010, followed by the overview of the relief efforts during the natural disasters.

2.1 Political System of Pakistan

Figure 1 shows the electoral districts of Pakistan along with the geographic details of its location. Pakistan shares its borders with Afghanistan, China, India, and Iran. The provinces of Khyber Pakhtunkhwa and Balochistan share the border with Afghanistan, while the provinces of Punjab and Sindh share the border with India. Islamabad is the capital city of Pakistan. Administratively, it is also equivalent to a province known as the Federal Capital. Lahore and Karachi are the two main urban areas of Pakistan with population of 15 million and 25 million respectively.

The governing structure of Pakistan is a parliamentary system. The parliament of Pakistan has bicameral structure composed of the Senate and the National Assembly (NA). The National Assembly has 342 members, of which 272 members are elected through voting [1]. The tenure of the NA is 5 years, and the elections are held after every 5 years. In our analysis, the elections were held in October 2002, February 2008 and May 2013 respectively.

The 272 members of the NA are elected through the general elections held in 272 National Assembly constituencies. Out of the 272 electoral districts , 148 are in Punjab, 61 are in Sindh, 35 are in Khyber Pakhtunkhwa, 14 are in Balochistan, 12 are in the Federally Administered Tribal area (FATA), and 2 are in the Federal Capital, Islamabad [2]. The electoral districts are very heterogeneous in terms of area, but have the same population in each electoral district [3]. The voting structure is first-pass-the-post system. Each candidate

[1] Out of the 70 non-elected members, 60 seats are reserved for the women and 10 seats for the minorities. These seats are elected through an indirect proportional representation list system, whereby political parties submit their lists of women candidates for reserved seats to the Election Commission prior to the election (Constitution, Article 51).

[2] The administrative division of Pakistan has several layers. The most coarse layer is the provinces. There are 6 provinces: Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, FATA and the Federal Capital. The Gilgit Baltistan and Azad Jammu & Kashmir are also divisions within Pakistan. Thus, Gilgit Baltistan and Azad Jammu & Kashmir are not represented in the National Assembly and Senate of Pakistan. However, they have an autonomous government which is part of Pakistan. The second layer is of the districts. There are roughly 30 districts in each province.

[3] For instance, the Karachi city has 20 electoral districts, where as the whole province of Balochistan has only 14 electoral districts.

can belong to at most a single political party or decide to run independently without any political affiliation.

Historically, the two biggest parties in the political system of Pakistan are the Pakistan Muslim League Nawaz Sharif, PML (N) and the Pakistan's People Party (PPP). The PML (N) has strong base and support in the province of Punjab, while the PPP has its strength in the province of Sindh. Since, 1989, the PML (N) and PPP has had major representation in three governments. PPP secured the most number of votes in the 2008 elections, while the PML (N) secured the most number of votes in the 2013 elections. Apart from the two main parties, there are several other political parties. Muttahida Qaumi Movement (MQM) and Pakistan Tehreek-e-Insaf (PTI) are among the other political parties.

Apart from these four major political parties, there are several political parties with rightist and Islamic ideology. The three major Islamic parties include: Jamiat-e-Ulema-e-Islam (JUI-F), Jamiat Ulema-e-Pakistan (JUP) and Jamaat-e-Islami Pakistan (JI). Jamiat-e-Ahle Hadith, and Pakistan Isami Tehrik (ITP) (formerly Tehriq-e-Jafaria (TeJ)) are among the other two Islamic political parties. In 2002, these five parties had a political alliance, Muttahida Majlis-e-Amal (MMA). The alliance was formed as a result of direct opposition to the policies led by President Pervez Musharraf to support for the United States' war in Afghanistan (Adel, Elmi and Taromi-Rad, 2012) [4].

2.2 Islamic Parties and connections with Taliban

Since the inception of war-on-terror, the Jamiat-e-Ulema-e-Islam (JUI-F), Jamiat Ulema-e-Pakistan (JUP) and Jamaat-e-Islami Pakistan (JI) have voiced their disapproval of the Pakistan's support to the United State equivocally. Jamiat Ulema-e-Islam has its roots in the anti-colonial movement and pro independent Muslim state movement back in the 1920s. It has strong presence in the Khyber Pakhtunkhwa and Balochistan. Jamaat-e-Islami Pakistan also traces back its roots before the independence of Pakistan. All of these parties have presence in the provinces of Khyber Pakhtunkhwa and Balochistan, which share the border with Afghanistan.

The three parties merged together in 2002 as a result of common opinion and to provide strong opposition to the President Musharraf's unconditional support to the United States for the war-on-terror (Norell, 2007). This pro-Taliban stance was very popular among the province of Khyber Pakhtunkhwa in which the party gained majority. The MMA was able to form a coalition government in the province of Balochistan.

[4]However, the political alliance was broken just before the 2008 elections. The JI wanted to boycott the elections, while the other two parties wanted to run for the elections. This difference of opinion led to the break-down of the alliance into the three political parties as they were before.

Figure 1: The National Assembly Electoral Districts of Pakistan

All these parties emphasis on strict Islamic morals and principles in every day life. These parties have strong connections with the Afghan Taliban and share the same ideology:

> "All the individual parties in the MMA have links to militant groups, hence this coalition is of great interest when examining Pakistani links to the Taliban." (Norell, 2007, pg. 69)

> "The Muttahida Majlis-e-Amal (MMA), which President Musharraf made the official opposition party in the Pakistan Parliament after the 2002 elections, provides political cover to the extremists, openly supports the Taliban as the legitimate government of Afghanistan, and maintains close ties to its leadership" (Johnson and Mason, 2008, pg. 57-58)

Norell (2007) presents detailed historical analysis of the relations between the Taliban and the MMA. Khyber Pakhtunkhwa, Balochistan and FATA are the areas sharing border with Afghanistan. The major political parties in these provinces are also the parties which are pro-Taliban. Not only do the MMA and Taliban have connections, but they also trade benefits with each other. For instance,

> "When the Taliban came to power in Afghanistan in 1996 it enjoyed support from the JUI-F, which in turn gained popular support from Pashtuns living in NWFP, Baluchistan and the Federally Administered Tribal Areas (FATA)" (Norell, 2007, pg. 70)

> "The MMA has vociferously objected to Pakistani and U.S. operations in the tribal areas to ferret out Al Qaeda and Taliban fugitives despite knowledge that such persons are lodged in these areas. Continued successful political evolution of the MMA could have deleterious consequences for the U.S. led war on terrorism through encouraging militant recruitment, erecting operational barriers to Pakistani and U.S. forces seeking access to the tribal areas, and continuing to provide safe havens to Al Qaeda and Taliban fugitives." (Fair, 2004, pg.498)

Despite these connections, do the individuals associate MMA with the Taliban? More relevant question for our analysis is: do the individuals who vote for MMA are actually voting for Taliban? There are almost no studies which try to understand the demand for the militant groups [5]. The only paper we are aware of that tries to analyze the relation is Shapiro and Fair (2009). They found some evidence to the question above i.e. the support for the

[5] Almost all of them, exclusively, focus on the supply of militant groups and how it affects business as usual.

militants is correlated with: "a desire for change-positive or negative- in the perceived role of Sharia in Pakistan" (Shapiro and Fair, 2009, pg. 116), and political grievances. None of the other conventional factors: poverty, education, religiosity and desire for stronger democracy were correlated with the support for militant groups. They do not correlate the actual voting behavior of the individuals, but rather rely on self-reported measures.

2.3 The 2005 Earthquake

The earthquake took place on 8th October 2005 near the city of Muzaffarabad, around 120 km north of Islamabad. The magnitude of the earthquake was measured as 7.6 on the Richter magnitude scale. It was the worst earthquake to hit Pakistan ever, and the 15th worst earthquake around the world since 1900. The earthquake caused 75,000 deaths, 70,000 were injured and 3.5 million people were left homeless. The estimated economic damage caused by the earthquake was around $5.2 billion.

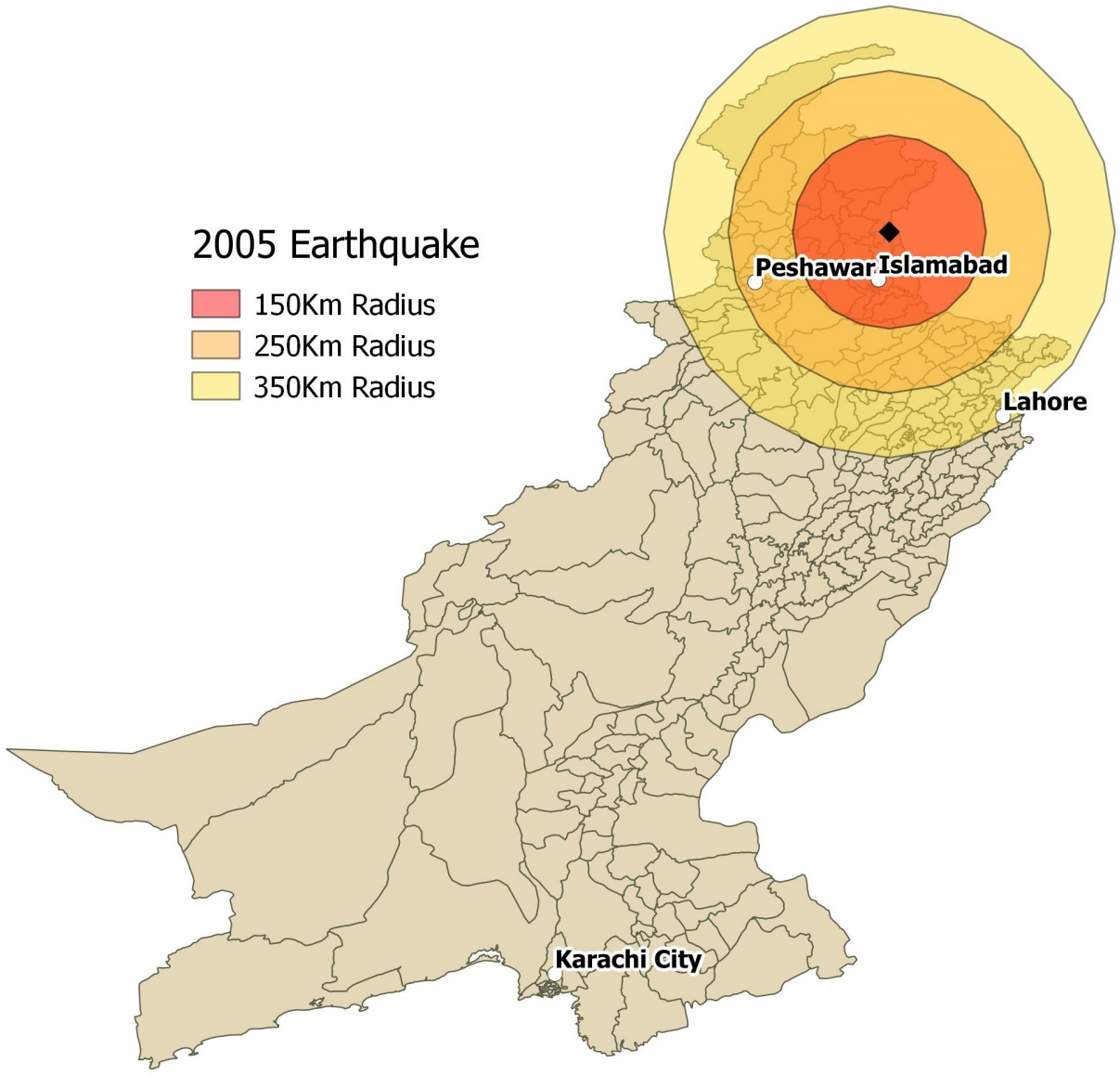
Figure 2 shows the location of the epicenter of the earthquake. The figure also shows the 150 km, 250km and 350 km circle radius around the epicenter. Islamabad lies within the 150 km radius of the epicenter, Peshawar lies within the 250 Km while Lahore lie at 350 km radius of the epicenter of the earthquake. The earthquake mainly affected the parts of Khyber Pakhtunkhwa, Punjab and Federal Capital.

The earthquake show rapid response from the government, citizens and the international donors and community.

> "Despite daunting challenges, including the difficult mountainous terrain and the race against time to provide basic shelter to the homeless prior to the arrival of the Himalayan winter, the humanitarian response to the earthquake was perceived by many to be one of the largest and most effective responses to a natural disaster to date." Wilder (2008) page 8

> "Within 24 hours of the earthquake the UN Disaster Assessment and Coordination (UNDAC) team flew into Islamabad and worked with the Government of Pakistan (GoP), donors, UN agencies, and NGOs to establish coordination structures. Within three days it had prepared and issued a Flash Appeal for $312 million to support a six-month emergency response, which two weeks later was increased to $550 million ... Within 48 hours of the earthquake the first of 24 US helicopters arrived in Islamabad from Afghanistan. Soon approximately 1,200 US military personnel had arrived in Pakistan to assist with relief efforts, which included a medical team to run a US Army Mobile Army Surgical Hospital (MASH) in Muzaffarabad, and a 125-person Naval Mobile Construction

Figure 2: The 2005 Earthquake Epicenter



Battalion to clear roads and debris, assist in setting up IDP camps, and rebuild infrastructure. In addition to US military forces, the NATO Response Force also deployed approximately 1,200 specialist personnel including engineers and medical staff from 17 NATO countries to participate in NATO's first purely humanitarian mission. NATO forces also operated two "air-bridges" to fly relief supplies to Pakistan from bases in Germany and Turkey" Wilder (2008) page 14-15

2.4 The 2010 Flood

The 2010 floods in Pakistan have been called the greatest humanitarian crisis in recent history by the United Nations, with more people affected than were affected by the South-East Asian tsunami and the 2010 earthquake in Haiti combined Ferris (2011). In terms of economic damages, the flood of 2010 caused an estimated damage of $9.7 billion.

The flood was caused by abnormal monsoon rains in late July, 2010 which resulted in floods across all the provinces of Pakistan. In terms of the land area, almost one-fifth of Pakistan was affected. While, more than 20 million people i.e. one-eighth of the population of Pakistan was directly affected by the flood. It was the worst flood in the history of Pakistan, causing three times more people affected than the second worst flood which hit the country in 1992. In terms of the economic costs, it is the worst natural disaster to hit Pakistan ever. It caused more than three times the economic damage compared to the second worst natural disaster of Pakistan: the earthquake of 2005.

Figure 3 shows the extent of the flood in September 2010. As it is apparent from the figure, the flood were widespread all over Pakistan. The areas from all the major provinces were affected. Areas around the river Indus were severely affected, while rest of the areas were moderately affected. Most of the eastern part of Punjab and south-western part of Balochistan was unaffected by the flood.

Khyber Pakhtunkhwa was the earliest to get affected. On 20th July, Peshawar, the capital city of Khyber Pakhtunkhwa received heavy rain-fall. Soon, the rest of the province, in series of rain-falls, was affected. The flood in the mid-Augusts, reached the southern part of the country and affected southern Punjab, northern Sindh and Balochistan.

The direct damages to the infrastructure was estimated to be around $11 billion, while the cost of re-constructing the infrastructure was estimated to be around $ 8 billion. The flood caused large-scale damage not only to the houses and infrastructure of the area, but also resulted in wide-scale agricultural damages. More than 700,000 acres (3,000 km2) of cotton, 200,000 acres (800 km2) acres each of rice and cane, 500,000 tonnes of wheat and

300,000 acres (1,000 km2) of animal fodder were destroyed by the flood (of Pakistan, 2010).

The government response to the flood was very poor. The NDMA was completely ill-equipped and unprepared to deal with a natural disaster of such an extent. The NDMA was in complete disarray (Ahmed, 2013). At first, the government miscalculated the gravity of the situation. The first heavy rain of the monsoon which lead to flooding in the Khyber Pakhtunkhwa took place on 20th July 2010. However, the Flash Appeal for the relief and early recovery was not released until 20 days after the flood i.e. 9th August 2010 by that time most of the Pakistani land was under water. The poor rehabilitation and relief efforts was a result of both government incompetence and lack of international support. The government initially underestimated the effect of the floods and did not act promptly. The President of Pakistan at that time, Asif Ali Zardari, continued his trip to the United Kingdom despite the gravity of the situation. As of August 9, the international governments had committed less than $45 million. As a comparison, in the first ten days after the earthquake in 2005, the international governments had committed $247 million [6]. The poor response by the government raised concerns about the stability of Pakistan and its strength to counter terrorism (Kronstadt, 2010).

The poor rehabilitation was visible among the disaster affected regions. For instance, Doocy et al. (2013) surveyed households in the affected areas six months after the 2010 flood[7] and showed that the need for flood aid was uniformly present in all the affected areas. But, only half of the affected areas reported receiving food aid ever [8].

2.5 Relations between Pakistan and U.S.

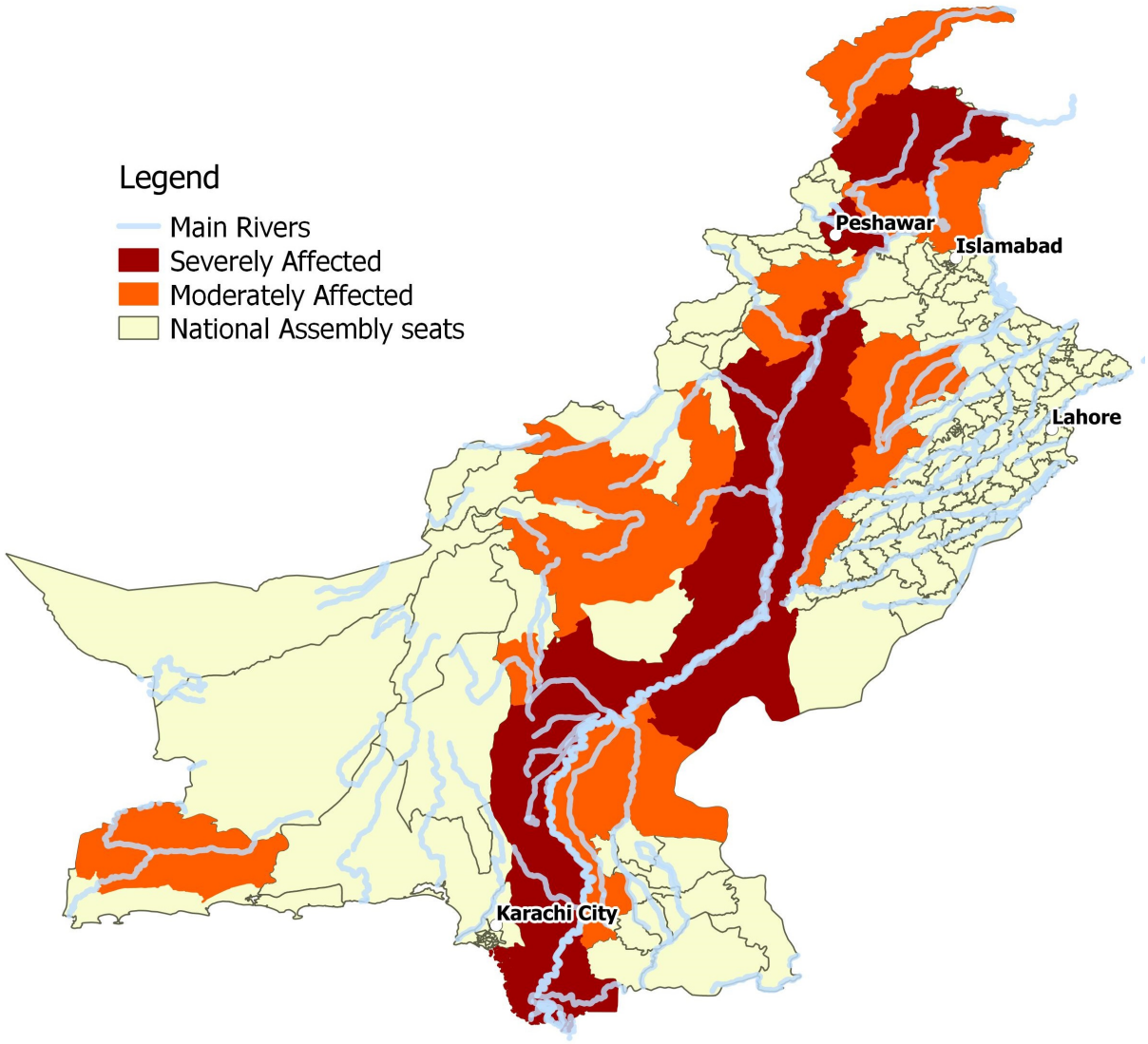
Given the importance of the US-Pakistan relationship in the determination of the international aid response we provide here a short description of the timeline. In particular, we focus on the time frame of the two natural disasters and give some evidence on how this affected the relief response received by the Pakistani state.

[6] Other natural disasters around the world received intermediate amount of funding. For instance, in the first ten days of Cyclone Nargis, which hit Myanmar in May 2008, the international governments committed $110 million. Similarly, the earthquake in January 2010 in Haiti also saw a commitment of $742 million during the first ten days of the disaster.

[7] They reported that 95% of the households reported damage to their house, and 82% reported permanent damage to the house. Moreover, 85% of the households were displaced for more than two weeks.

[8] While half of the respondents cited as receiving aid in the first three months after the flood, only one-third of the respondents cited the same in the subsequent three months. More than 60% of the food needs were unmet across the flood affected areas six months after the flood. Farmers and daily-wage laborers were among the worst hit by the flood. They found that the common targeting practices were not kept in mind when distributing the food aid. That is, they showed that larger households, female headed households and internally displacement households were not significantly more likely to receive food aid compared to other households. The urban households were more likely to receive food aid despite the fact that rural households were the ones worst affected, both in terms of magnitude of people affected and magnitude of the damage.

Figure 3: Flood Affected Districts



The relations between Pakistan and the United States before 9/11 were tense. In 1998 Pakistan tested its nuclear technology despite strong international pressure. As a result Pakistan faced several sanctions and limitations from the international community. In 1999, the democratic government was overthrown by the military general, Pervez Musharraf, who declared himself the caretaker of the country until the next elections take place. United States disapproved the overthrow of democratic government by General Musharraf [9] .

However, after the 9/11 the image of Pakistan and Musharraf was completely transformed. Pakistan quickly joined the United States on the war-on-terror and became a key strategic ally of the U.S. As a result, image of Pakistan and General Musharraf was completely transformed from a rogue state and pariah to an ally and messiah [Fair (2012)]. The sanctions and limitations on Pakistan was released and it received several billions in aid, military funds and loan forgiveness.

Relationship between the U.S. and Pakistan started to quickly deteriorate in 2008 with a change in presidency for both countries. The U.S. started to no longer trust Pakistan as an ally because, between other things, what they claim is the misuse of the military funds given to Pakistan in the last years. In particular instead of the use of funds to counteract terrorism in the West of Afghanistan they claim funds have been use for the long-lasting conflict with India. This was especially troublesome for the U.S. as it became evident that many high-profile terrorist were safely living in Pakistan. At the same time Pakistan lost trust in the U.S. as the new administration increased the drone attacks in Pakistani territory, many times without informing the Pakistani government.

2.6 Data sources

We use data sets from several different sources. The political outcome data set is constructed using the official election outcomes from the Election Commission of Pakistan (ECP). The electoral outcome in each electoral district is hand collected from the ECP website and recorded. For each district, we have the information on the number of votes won by each candidate and his/her political affiliation. The candidates do not need to have a political affiliation to run; they can choose to run as independent candidates. In the 2002 elections, the Muttahida Majlis-e-Amal (MMA) participated as a single political party composed of the coalition of the following five parties: Jamiat-e-Ulema-e-Islam (JUI), Jamiat Ulema-e-Pakistan (JUP), Jamaat-e-Islami Pakistan (JI), Jamiat-e-Ahle Hadith, and Pakistan Islami Tehrik (ITP). The number of votes secured by the MMA over the total votes casted is used to determine the proportion of votes secured by the MMA in an electoral district.

[9] Infact when the President Clinton visited the South Asia in 2000, he spent only few hours out of a week long tour in Pakistan, and refused to shake hands with Musharraf.[Rennack (2001)]

The candidate from the MMA appeared in 171 out of 272 electoral districts in 2002. Their representation is spread over all the provinces. The MMA is widely represented in the provinces of Balochistan and Khyber Pakhtunkhwa. They appeared in 13 out of the 14 electoral districts in Balochistan, and 32 out of the 35 electoral districts in Khyber Pakhtunkhwa. In the 150 electoral seats of Punjab and 61 electoral seats of Sindh, the MMA appeared in 90 and 36 electoral districts respectively. However, in the FATA the MMA did not contest from any electoral district [10].

Before the 2008 elections, the alliance of the five parties was broken due to internal power struggle among the parties. The split was not due to ideological differences, but rather between the two major parties to gain more power within the alliance. This clash also resulted in split of Jamiat-e-Ulema-e-Islam (JUI) into Jamiat-e-Ulema-e-Islam, Fazl-ur-Rehman (JUI-F) and Jamiat-e-Ulema-e-Islam, Samiul Haq (JUI-S). In order to associate the votes secured by the MMA in 2008 (and subsequent election, i.e. 2013), the votes are aggregated for these six political parties. There are electoral districts in which some of these six parties do not have a candidate representation. There are electoral districts in which there is no candidate from any of the six parties, while there are districts with candidate from all the six parties. We compute the share of the MMA as the sum of the shares of the political parties that present in that electoral district. We compute this share if two of the three major parties of the previous alliance MMA participate from that particular district. That is, if in any district less than the two major parties participate, we label it as if the MMA did not participate in that particular electoral district [11]. The data on the flood of 2010 is gathered from two different sources: United Nation Office for the Coordination of Humanitarian Affairs (UNOCHA) and the National Disaster Management Authority (NDMA). We take the details which areas were affected by the flood from the UNOCHA. UNOCHA reports the areas which were affected by the flood at sub-district level. The maps published by UNOCHA were processed and digitized for the analysis. The data on funding gap is taken from the NDMA. NDMA reported the funding gap present in the flood affected and other areas which were indirectly affected by the flood (for instance, due to rehabilitation in the neighboring electoral district). They stored this information in form of a map representing the funding gap faced by an area in form of categorical variable. That is, the funding gap in

[10] This is not that surprising. The politics in FATA are more localized than other provinces. Usually, the representatives from FATA run without any political affiliation i.e. as independent candidates.

[11] We tried with other definitions as well. For instance, labeling MMA as not participate only if all three major parties not participate from an electoral district; labeling MMA as not participate if two of the major parties do not participate in the electoral districts. The results with these different definitions of the share of MMA are presented in the Robustness section. All the different definitions of the vote share of MMA lead to the same qualitative result, and our consistent with our mechanism; the magnitudes are adjusted accordingly.

a categorical variable with following categories: $0-20\%$, $20-40\%$, $40-60\%$, $60-80\%$ and $80-100\%$. The maps published by NDMA were processed and digitized for the analysis.

3 Empirical Methodology

In this section, we provide brief overview of the empirical framework for testing our mechanism. For each natural disaster we compare the MMA results before and after a natural disaster, between places that were affected or not by a natural disaster. Specifically, we estimate:

$$MMA_{it} = \alpha_i + \delta Post_t + \beta_1(affected_i * Post_t) + X'_{it}\gamma + u_{it}, \quad (1)$$

where MMA_{it} is the proportion of votes secured by the Muttahida Majlis-e-Amal in electoral district, i, at elections, t [12]. The variable $affected_{it}$ is a variable denoting whether electoral district, i, was affected or not by the natural disaster. For the earthquake we will use different measures of closeness to the epicenter while for the flood we will use the definition provided by the UNOCHA. $Post_t$ is a time dummy that indicates the election-year after the natural disaster. In the case of the earthquake of 2005 this is the election of 2008 and in the case of the flood of 2010 this is the election of 2013. We can then potentially control for any $X_{i,t}$ district variable. The time dummies common to all electoral districts is captured by the term δ. α_i are the electoral districts fixed effects.

This methodology has several advantages. First, it controls for the preexisting differences among the electoral districts through the electoral district fixed effects. Second, the specification allows for differences in the result of election result for the MMA between elections through the term δ.

In order to obtain consistent average treatment effect of the natural disaster on the proportion of votes secured by the MMA in the election after, the treatment should be independent of the unobserved error term [13]. That is, the areas which were affected compared to the unaffected areas should not be systematically different across the unobservables.

Formally, $E(u_{it}|affected_i = 1, X_{it}, \alpha_i) = E(u_{it}|affected_i = 0, X_{it}, \alpha_i)$.

This expression might not hold in our case. A first source of concern involves the specification of the 2010 flood. The reason is that in Pakistan heavy monsoon rains and melting of snow in the northern mountains in the summer produces often floods around the river Indus. In fact, some of the areas are flooded almost every year. Given that areas affected

[12] Note that $t = 2002, 2008$, for the analysis of the 2005 earthquake and $t = 2008, 2013$ for the analysis of the flood

[13] For simplicity of the argument, consider that the natural disaster has similar effect on all the affected areas. The argument presented below is valid for the heterogeneous effects of flood with minor changes.

by the 2010 flood are frequently flooded also other years there may be systematic difference in the people living in these areas. This would violate the above expression and generate inconsistent average treatment effects as the citizen of these areas may have different voting patterns independently of the occurrence of the natural disaster. In order to control for this potential factor that can lead to inconsistent estimates, we control for the ex-ante frequency of flood for each given electoral district multiplied by the time dummy ($frequency_i * Post_t$). What this achieves is to allow for the possibility of trends in MMA votes to change depending on the ex-ante frequency of the flood and because of this our identification of the parameter β_1 comes only from the fact that some places where affected by the 2010 flood while others not.

Similarly the areas that are predominantly of Pashtun ethnicity (Located in the West of Pakistan) were particularly affected both by the 2005 earthquake and the 2010 flood. This may be a source of concern as the Pashtun ethnicity has been historically very connected to the Taliban. This may cause them having very different voting patterns towards the MMA independently of the natural disasters. We solve this potential problem by allowing majority Pashtun electoral districts to have different MMA voting patterns ($Pashtun_i * Post_t$).

The most complete specification will then be:

$$\begin{aligned} MMA_{i,t} = \quad & \alpha_i + \delta Post_t + \beta_1 Affected_i * Post_t + \\ & \beta_2 frequency_i * Post_t + \beta_3 Pashtun * Post_t + u_{i,t} \end{aligned} \tag{2}$$

where $frequency_i$ denotes ex-ante propensity of flooding for each electoral district and $Pashtun_i$ is a dummy that takes value 1 if the electoral district is majority of Pashtun ethnicity.

4 Results

4.1 Baseline Results: The 2005 Earthquake

In this section, we discuss the effects of the earthquake on the vote share of the MMA. In the baseline results presented here an electoral district is considered affected by the earthquake if it's located at less than 250Km from the epicenter. We will later show how robust these results are to different definitions. For all the estimations we use data from the 2002 and the 2008 national elections.

As displayed in Table 1 the MMA lost many votes between 2002 and 2008 election. Importantly for testing our mechanism they lost disproportionately so in the areas affected by the earthquake. Our preferred specification is found in is column (2) were we control

Table 1: The Effect of the 2005 Earthquake on MMA vote shares

	(1) Share MMA	(2) Share MMA	(3) Share MMA	(4) Share MMA
250Km * Y2008	-0.135***	-0.160***	-0.137***	-0.136***
	(0.0356)	(0.0364)	(0.0334)	(0.0338)
Observations	336	336	336	336
Freq. Earth * Y2008	NO	YES	YES	YES
Pashtun * Y2008	NO	NO	YES	YES
Num. Parties	NO	NO	NO	YES

Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

for potentially different trends in voting pattern between Pashtun and non-Pashtun areas of Pakistan. The results shows that places affected by the earthquake experienced and extra 11 percentage points drop in the voting share for the MMA. This is more than one third of the votes that the MMA had in the 2002 election in the affected areas. This translates to 730'000 less voters for the MMA between the 2002 and 2008 in the areas affected by the earthquake. In case our hypothesis is correct, and this is driven by the high level of state capacity displayed by the Pakistani government in handling the 2005 earthquake, this result shows that support for Taliban can be largely swayed by the presence of an effective state.

In column (3) we additionally control by the number of parties that participated in that election in each electoral district. Results remain stable providing evidence of how the loss in votes are not driven but an increase political competition in some particular electoral districts but by the bad electoral performance of the MMA. Specification that control for the number of parties are not our preferred specification as they may incur in the bad control situation because the natural disaster itself is affecting the number of parties present in one election.

4.2 Baseline Results: The 2010 Flood

In this section, we discuss the effects of the flood on the vote share of the MMA. In the baseline results presented here an electoral district is considered affected by the flood following the definition by UNOCHA displayed in Figure 3. For all the estimations we use data from the 2008 and the 2013 national elections.

Results found in in Table 2 indicate how in general the MMA won some votes between 2008 and 2013 election. What we are particularly interested for testing our mechanism

Table 2: The Effect of the 2010 Flood on MMA vote shares

	(1) Share MMA	(2) Share MMA	(3) Share MMA	(4) Share MMA
Affected * Y2013	0.0453***	0.0538***	0.0302**	0.0302**
	(0.0130)	(0.0143)	(0.0119)	(0.0119)
Observations	336	336	336	336
Freq. Flood * Y2013	NO	YES	YES	YES
Pashtun * Y2013	NO	NO	YES	YES
Num. Parties	NO	NO	NO	YES

Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

is that they won disproportionately so in the areas affected by the flood. Our preferred specification found in is column (3) were we control for potentially different trends in voting pattern between Pashtun and non-Pashtun areas of Pakistan while at the same time also letting electoral districts with ex-ante different frequency of flood have potentially different trends. The electoral districts affected by the flood experienced an extra 3 percentage points increase in the voting share for the MMA. This is almost a 40% increase in the votes of the MMA compared to the 2008 election in the affected areas. This translates to an extra 560'000 voters for the MMA between the 2008 and 2013 in the areas affected by the flood. If we combine this result with the one found when analyzing the 2005 earthquake we can see how the difference between a well manage and a badly managed natural disaster can move more than a million voters away from an extremist party like the MMA.

4.2.1 Mechanism: Funding Gap

In order to shed more light on the mechanism underpinning these changes, we utilize the funding gap data (the difference between needed and received aid). This funding gap data is available for the flood of 2010 calculated at the 12th of November of 2010 four month after the flood. Following the previous sections, we estimate similar difference-in-difference specification:

$$MMA_{it} = \alpha_i + \delta Post_t + \beta(FundingGap_i * Post_t) + X'_{it}\gamma + u_{it}, \tag{3}$$

where $FundingGap_i$ represents the funding gap in district i. $FundingGap_i$ is between zero and one.

One potential problem with the specification above is that funding gap may not be exogenous. The reason of this is that both the national government and international donors may decide to strategically provide aid in places that are either gaining or losing support for the Taliban or the MMA. Additionally, is possible that even if the donors are not acting strategically they maybe just can't deliver aid in places where the Taliban or the MMA had gained a lot of support.

The intensity of the flood provides an exogenous variable that can be used to predict the funding gap. First, comparing places affected and not affected by the flood the funding gap is higher for the one affected as they are the ones that received most of the damage. Notice even places not affected by the flood ask for some aid as these region had also suffered some minimal damages. Added to this, places not affected by the flood also need aid in order to help displaced people from neighboring areas. Looking at the affected areas the ones that were severely affected are most probably the one that have the highest funding gap. This areas need vast amounts of money and are generally difficult to be reached. Finally, we also use information about the ex-ante efficiency and capacity of the government in providing aid proxied by the distance of an electoral district from the provincial capital. One potential concern of this second instrument is that the distance from the provincial capital may be correlated with many unobservable factors that affects the patterns of voting for the MMA.

The instrument may provide us with less biased estimates than the ones we obtain from OLS. However, there are several reasons which may affect the validity of the instruments. For instance, being affected by the flood may have direct effect on political preferences independent of the funding gap: people who are affected by the flood become more politically liberal and vote for higher redistribution regardless of the funding their area receives. We briefly argue that since the nature of the shock was so big, and the funding was so scarce, the decision to systematically assign funding was not rampant. In fact, the funding in many electoral districts was assigned on basis of the need of the area.

Results in Table 3 show how a higher level of funding gap in the 2010 flood resulted in an increase in the votes for the MMA in the 2013 election. Result of our preferred specification in column (2) imply that every 15.8 percentage points increase in funding gap increases the vote of the MMA by one percentage point. Similar results are displayed in column (3) where every 11.8 percentage points increase in funding gap increases the vote of the MMA by one percentage point. The overidentification tests show how their is in-sample evidence of the validity of the instruments.

We then estimate the non-parametric relation between the change in MMA vote share and the funding gap. Similar to the DiD, we are comparing high funding gap areas to the low funding gap areas and analyzing how much do the MMA gained in the high funding gap areas

Table 3: The Funding Gap and MMA vote shares

	(1) OLS	(2) IV	(3) IV
Funding Gap * Y2013	0.0679***	0.0634***	0.0846***
	(0.0122)	(0.0236)	(0.0207)
Observations	336	336	336
Freq. Flood * Y2013	YES	YES	YES
Pashtun * Y2013	YES	YES	YES
Instruments	.	Moderate * Y2013	Moderate * Y2013
		Severe * Y2013	Severe * Y2013
			Dist. Capital * Y2013
F-stat	.	38.28	39.60
Pvalue Overind.	.	.998	0.162

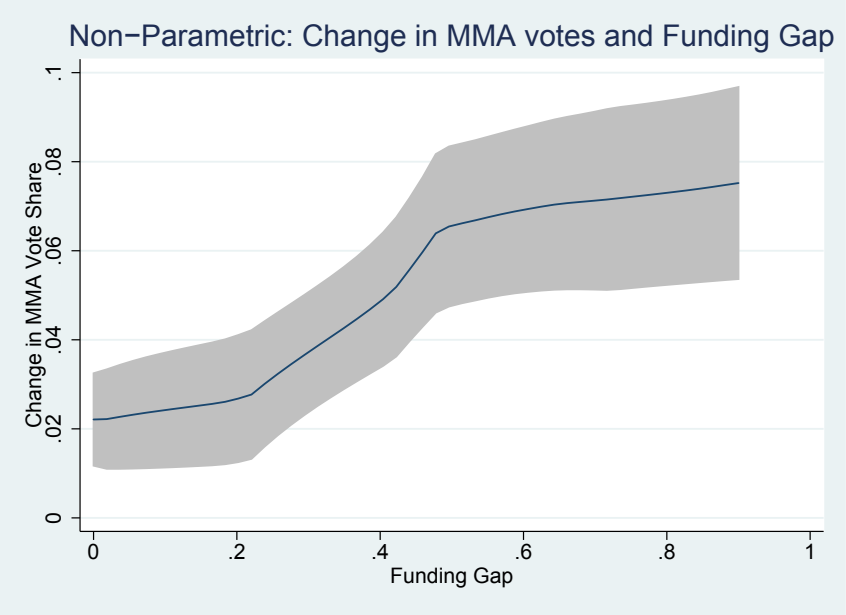
Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS for column (1) and IV for the remaining. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

relative to the low funding gap areas. However, we are not imposing a linear relation between funding gap and change in MMA vote share. Instead, we are calculating the effect on MMA vote share for each local value of the funding gap. Non-parametric estimation has several advantages over the parametric one. The estimation does not impose any functional form on the relation as in parametric estimation. Instead, it fits the best polynomial which explains the relation. Moreover, it finds relation at every point in the distribution of the dependent variable i.e. local regressions throughout the distribution. This is more informative than the average effects.

Figure 4 plots the non-parametric relation between change in MMA vote share and the funding gap along with the 95% confidence interval. The figure shows that the relation between change in MMA vote share and funding gap is concave with very close to being linear. The relation is strongest in the interval where the funding gap is between 20 and 60%. Areas with funding gap of 40% experienced a three-fold increase in MMA vote share, while areas with funding gap 80% experienced a four-fold increase in the MMA vote share compared to the areas with no or very little funding gap.

The results clearly indicate that funding gap is an important determinant of increase in the vote share of MMA. These results highlight the importance of funding gap as one of the mechanisms through which the change in support for MMA is operating. The areas which had higher funding gap witnessed greater increase in the vote share of the MMA in the entire

Figure 4: Non-Parametric Estimation: Funding Gap and MMA Vote Share



range of funding gap

4.3 Alternate Explanations

4.3.1 Punishing or Rewarding the Incumbent

An alternative explanation that could generate the results found in the previous section is the punishing of the incumbent after a natural disaster. It is documented in the literature that individuals punish the incumbents for natural disasters and other shocks which the politicians have little control over (Cole, Healy and Werker, 2012). According to this argument, the vote share of the incumbent should decrease more in the areas affected by any natural disaster.

An alternative theory is that voters can reward the incumbent in case of the good management of a natural disaster, as in the case of the 2005 earthquake. Instead, in the case of the 2010 flood, voters can blame the incumbent political party, for not providing proper rehabilitation after the flood. This can be true especially when the individuals hold the political party directly responsible for the recovery. Thus, the accountability or anger against the incumbent can be thought of as a function of the management of the natural disaster.

These two mechanisms can then generate a change in the vote share of the incumbent that could ultimately translate in a change in the vote share for the MMA.

Results in Table 4 show how the incumbent results are not affected by the natural disasters as described by this theory. In the earthquake scenario, as shown in column (1), the incumbent was the PML(Q) that lost some votes between 2002 and 2008 but not specifically

Table 4: The Effect of Natural Disasters on Incumbents and Competitors

	Earthquake			Flood		
	(1) Incumbent	(2) Competitor 1	(3) Competitor 2	(4) Incumbent	(5) Competitor 1	(6) Competitor 2
POST * Affected	-0.0174	-0.00356	0.0371	0.0822***	0.0124	-0.0763***
	(0.0305)	(0.0242)	(0.0333)	(0.0298)	(0.0324)	(0.0286)
Observations	304	490	416	490	416	304
Pashtun * POST	YES	YES	YES	YES	YES	YES
Freq. Earth * Y2008	YES	YES	YES	NO	NO	NO
Freq. Flood * Y2013	NO	NO	NO	YES	YES	YES

Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS. The dependent variable is the share of MMA in the 2002 or 2008 elections for the earthquake and 2008 or 2013 elections for the flood. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

in the areas affected by the earthquake. In the flood scenario, as shown in column (4), the incumbent was the PPP that lost many votes between 2008 and 2013 but actually won votes in places affected by the flood.

4.3.2 Political Competition

Another natural explanation for the observed change in MMA vote share can be political competition. This explanation is closely related with the previous one. In this framework not only the votes for the incumbent could be affected by the natural disaster but also its main competitors. In the case of the 2005 earthquake given the good performance of the government the main political competitor could observe a decrease in votes given this political competition. Instead in the badly managed 2010 flood we could see an increase of votes for the main political competitor.

Results in Table 4 show how the two main competitors political results are not affected by the natural disasters as described by this theory. In the earthquake scenario, as shown in column (2) and (3), the two main competitors were the PML(N) and the PPP. They both won considerable amounts of votes between 2002 and 2008 but no party lost specifically in the areas affected by the earthquake as postulated by the theory of political competition. In the flood scenario, as shown in column (5) and (6), the two main competitors were PML(N) and PML(Q). The PML(N) won many votes between 2008 and 2013 while the PML(Q) lost many. None of the two competitors won votes specifically in places affected by the flood.

Only the MMA lost many votes in places affected by a natural disaster when this was

well managed by the government but won when it was badly managed. As described before we claim that the main feature that differentiate the MMA with respect to other political parties is their connection to the Taliban groups and their ability of providing goods that compete with the formal state.

5 Heterogeneity, Robustness and Identification

5.1 Intensity of the Treatment

In this section we first look how the effect of the natural disasters changes given the intensity of the treatment. For the earthquake of 2005 we proxy the intensity with the distance from the epicenter. For the 2010 flood we use the severity of the flood index created by the UNOCHA that separates affected areas in severely and moderately affected as shown in Figure 3. As an alternative measure we use the distance from the Indus river, the main river crossing Pakistan that suffered from the floods of 2010.
Looking at Table 5 we can observe how the the baseline results are still present using alternative definition of being affected by the earthquake in columns (1) and (2). Results are slightly lower than in the baseline specification. We then explore how the effect on the MMA votes changes with the distance from the epicenter by estimating the following equation:

$$MMA_{it} = \alpha_i + \delta Post_t + Post_t * f(dist\, epi_i) + X'_{i,t}\gamma + U_{i,t}$$

Results of estimation were the function $f(.)$ is a 4th degree polynomial are shown in Figure 5 on the left panel. The MMA's lost votes are concentrated close to the epicenter. As distance from the epicenter increases the effects gets closer to zero. The effect is statistically not different from zero if the electoral district is at more than 600Km. For a reference around 20% of the districts are located at less than 200Km from the epicenter. The median distance is 400Km.

In column (4) of Table 5 we estimate the effects of the 2010 flood with potentially differential effects between moderately and severely affected areas. Severely affected areas display a slightly higher increase in the MMA vote. Alternatively as a proxy for the severity of the flood we use the distance to the Indus river and explore the changes in MMA votes by estimating the following equation:

$$MMA_{it} = \alpha_i + \delta Post_t + Post_t * f(dist\, indus_i) + X'_{i,t}\gamma + U_{i,t}$$

Notice that the distance from the Indus river is a imprecise proxy for the severity of the flood because it will also depend on many other geographical factors including the morphology of the terrain around the river. Still as can be partly observed in Figure 3 many of

Table 5: Heterogeneity and Robustness

	Earthquake				Flood	
	(1) 150Km	(2) 350Km	(3) Long-Run	(4) Dist Afgh	(5) Severity	(6) Dist Afgh
Affected * Y2008	-0.0995**	-0.113***	-0.127***	-0.372***		
	(0.0406)	(0.0265)	(0.0331)	(0.0699)		
Affected * Y2013			-0.0798***			0.106***
			(0.0286)			(0.0346)
Affected * Dist Afgh * Y2008				0.113***		
				(0.0245)		
Affected * Dist Afgh * Y2013						-0.0280***
						(0.00886)
Moderate * Y2013					0.0280*	
					(0.0157)	
Severe * Y2013					0.0332*	
					(0.0171)	
Observations	336	336	504	336	336	336
Pashtun * Y2008	YES	YES	YES	YES	NO	NO
Pashtun * Y2013	NO	NO	YES	NO	YES	YES
Freq. Distater * Y2008	YES	YES	YES	YES	NO	NO
Freq. Distater * Y2013	NO	NO	YES	NO	YES	YES

Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS. The dependent variable is the share of MMA in the 2002 or 2008 elections. In Column (3) the election data of 2013 is added. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

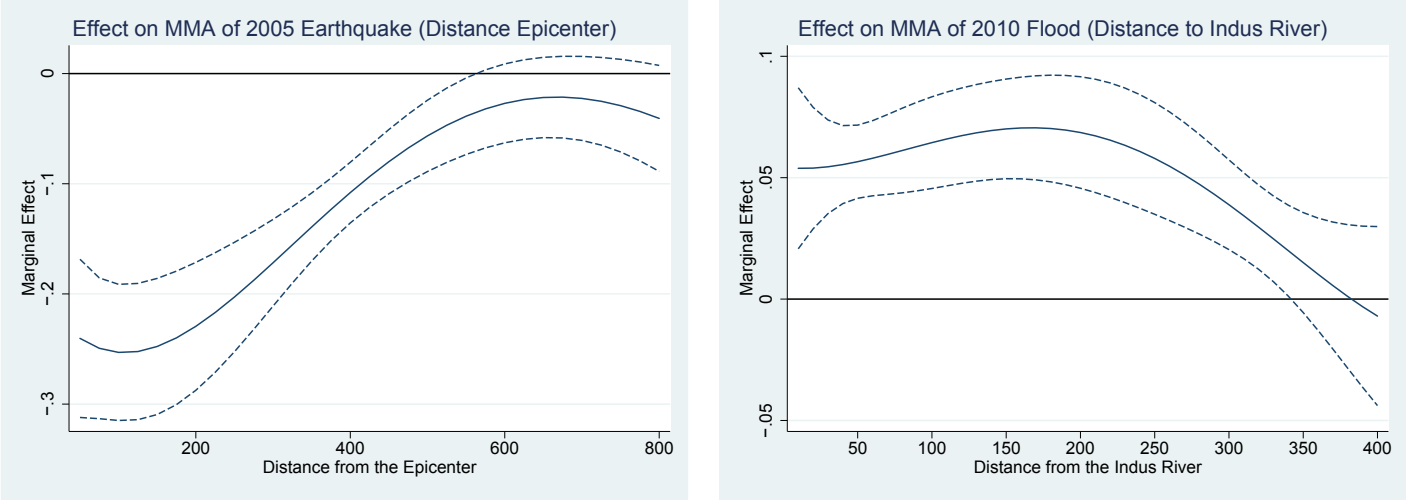


Figure 5: The effect of the natural disasters on MMA vote share as a function of the intensity

the most affected areas are close to the Indus river. Results of estimation were the function $f(.)$ is a 4th degree polynomial are shown in Figure 5 on the right panel. The MMA gained around 5 percentage points in electoral districts at less than 200km from the Indus river. After that the effect decreases until it reaches zero at 350Km. The median distance is 112Km with only 15% of the electoral districts being at more than 300Km. This is inline with the fact that the flood affected a large proportion of the Pakistani population and consequently letting the MMA gain votes in many electoral districts.

5.2 Long-run Effects

Additionally for the earthquake scenario we can asses if the results we have observed in the election immediately after the natural disaster are present also in the long-run. We can do so for the earthquake scenario because we observe the results of two elections after the 2005 earthquake. In particular we estimate this, by running the baseline analysis with the sample that include all elections and then let the earthquake have potentially different effects in the short-run (election of 2008 three years after the earthquake) and the long-run (the elections of 2013 eight years after the earthquake) by estimating the following:

$$MMA_{it} = \alpha_i + \delta_1 1(Year = 2008) + \delta_2 1(Year = 2013) + \beta_1 1(Year = 2008) * Affected_i + \beta_2 1(Year = 2013) * Affected_i + X_{i,t}^{'}\gamma + U_{i,t}$$

Estimates are shown in Column (3) of table 5. The effect of the earthquake decrease in time but is still statistically significant also in 2013 eight years after the earthquake. This is further evidence of the power of state capacity for eradicating terrorist groups.

5.3 Distance from Afghanistan

The mechanism we propose depends on the level of support provided by the Taliban in the areas affected by the natural disaster compared to that of the state. The capacity of the Taliban to provide support in a region greatly depends on their presence on the territory before the natural disaster happens. One proxy for the ex-ante presence is distance of the electoral district from the Afghanistan border. This is mainly because the Taliban originate from the area close to the Afghanistan border and have many tribal connection with this area. The Taliban have their headquarters in the North Waziristan and Mohamand agency in FATA, next to the Afghanistan border.

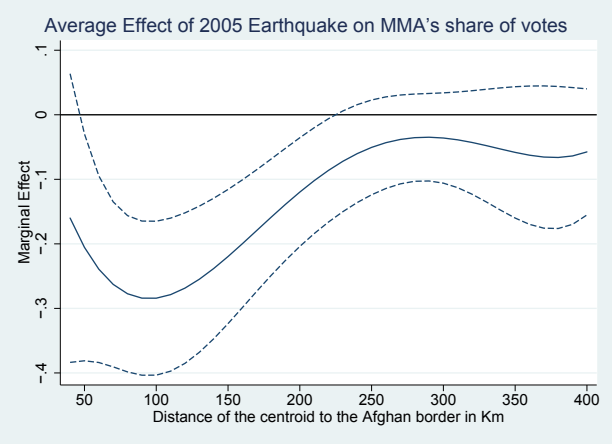
This implies that the areas closer to the Afghanistan border are more likely to receive greater Taliban support, everything else equal. This generates testable implication according to our mechanism.

Places close to the afghan border usually receive many social services from the Taliban. In the case of the earthquake a good performance by the state led to the crowding-out of the Taliban in the provision of natural disaster relief especially in this areas and because of this led to a substantial decrease in the MMA votes close to the Afghan border. Conversely, in the case of the 2010 flood, places close to the Afghan border managed to receive more aid with respect to places affected by the flood that were more far away. This should then lead to a disproportional increase in votes for the MMA in places close to Afghanistan. The following equation captures the mechanism formally:

$$\begin{aligned} MMA_{i,t} = \quad & \alpha_i + \delta POST_t + \beta_1 Affected_i * Post_t + f_1(dist\_afgh_i) * Post_t \\ & f_2(dist\_afgh_i) * Post_t * Affected_i + X'_{i,t}\gamma + u_{i,t} \end{aligned} \tag{4}$$

where $dist\_afgh_i$ is the distance of the electoral region, i, from the Afghanistan border. This can be also thought as a triple difference specification were we compare places affected or not by the natural disaster, before and after this natural disaster and observe how the results differ between places close and far away from the afghan border.

In Table 5 column (4) we show the estimates for a linear $f_1(.)$ and $f_2(.)$ in the case of the earthquake. The results are consistent with the mechanism we propose. As the distance to the border to Afghanistan increases the negative effect of the earthquake on the MMA



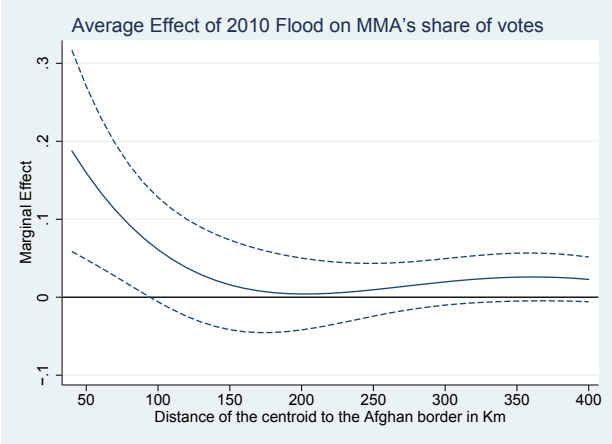


Figure 6: The effect of the natural disasters on MMA vote share as a function of distance from Afghanistan

decreases. Similarly in Table 5 column (6) we report the results for the 2010 flood scenario. We can observe how the increase of vote of the MMA are concentrate around the Afghan border. As the distance increases, and presumably the capacity of the Taliban to help decreases, the gains for the MMA party get smaller.

Similar results are displayed in 6 were we plot the effect of the earthquake (panel on the left) and the flood (panel on the right) as a function of the distance from Afghanistan. We do so by using a 4th degree polynomial for the function $f_1(.)$ and $f_2(.)$. Again we can observe how the gains or losses by the MMA are concentrate in the first Km. In the case of the earthquake the MMA did not lose any votes in electoral districts at more than 250Km far away from the Afghan border. In the case of the flood all the gains are concentrated in the first 100Km from the border.

5.4 Testing Parallel Trends Assumption

In the sections above, we employ difference-in-difference estimation to establish the causal effect of being affected by a natural disaster on the MMA vote share. Our identification strategy relies on the assumption that the trends in the affected and unaffected areas should be the same. That is, in absence of a natural disaster, the average vote share for the MMA would have changed in the same way in the areas which were affected by the natural disaster compared to the areas which were unaffected. Since for the case of the flood we have electoral data for two elections before the treatment in 2010, we can provide evidence of this parallel trends assumption. We do that by testing whether the vote share of MMA changed differently between the 2002 and 2008 elections in the affected areas relative to the unaffected areas.

Table 6: Testing Parallel Trends

	(1) Share MMA	(2) Share MMA	(3) Share MMA	(4) Share MMA
Affected * Y2008	-0.0526*	-0.0776**	-0.0431	-0.0455
	(0.0284)	(0.0303)	(0.0318)	(0.0315)
Observations	336	336	336	336
Freq. Flood * Y2008	NO	YES	YES	YES
Pashtun * Y2008	NO	NO	YES	YES
Num. Parties	NO	NO	NO	YES

Note: Robust standard errors clustered at the electoral district level are reported in the brackets. The table shows the results from estimating the baseline specification using OLS. The dependent variable is the share of MMA in the 2002 or 2008 elections. * denotes significant at 10 percent level, ** denotes significant at 5 percent level, *** denotes significant at 1 percent level.

Table 6 shows the results of the baseline regression for the flood using data before the flood occurred (2002 and 2008 election years). The results show, first of all, that for our preferred specification found in column (3) there were no significant differences in trends in the affected areas compared to the unaffected areas before the flood. Interestingly, they also show that controlling for Pashtun ethnicity and mean frequency is necessary for identifying the casual effect of the flood. As explained in Section 3 it was to be expected that electoral districts that are of Pashtun origin or that are regularly affected by the flood present different trends in the MMA vote shares. This is not a problem as we let Pashtun areas and areas that are regularly affected by the flood have different trends between election years. So the identification of our parameter of interest doesn't come from these differences but presumably only from the fact that some areas were affected by the flood while others not.

5.5 Falsifications Tests

In order to test if there are any unobserved trends in the data driving our results, we carry out one falsification tests for each natural disaster. The falsification exercise randomly assigns the status of affected by the natural disaster to electoral districts with the same proportion as the actual natural disasters[14].

Then we repeat 1000 times the following estimation:

$$MMA_{it} = \alpha_i + \delta POST_t + \beta(FAKEaffected_i * POST_t) + X'_{it}\gamma + u_{it}, \quad (5)$$

[14]The 2005 earthquake affected 22% of the electoral districts the 2010 flood 41% of them.

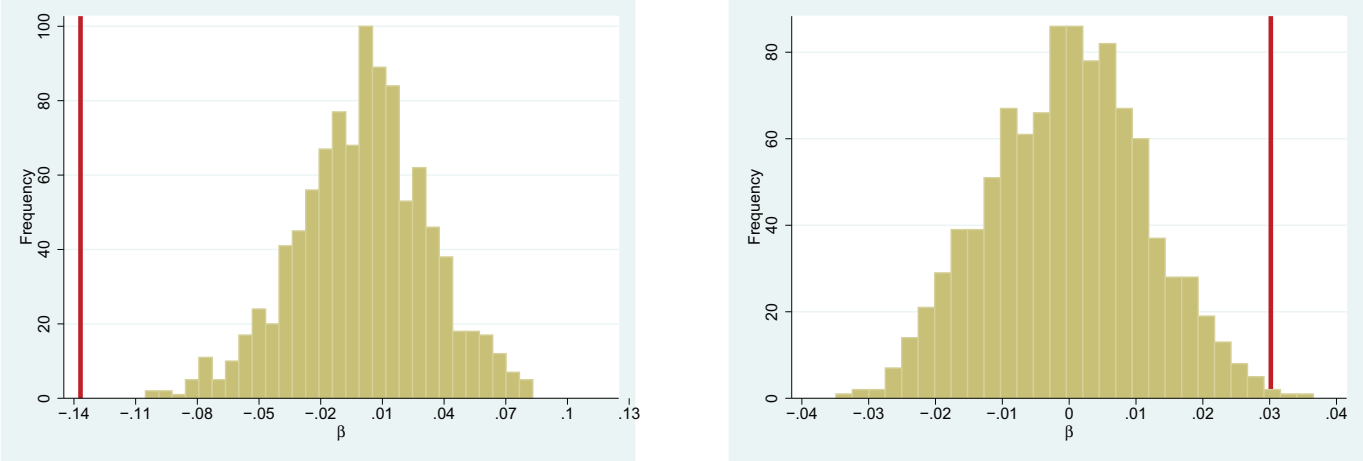


Figure 7: The figure shows the distribution of the of the β for the falsification test of the earthquake scenario (on the left) and the flood scenario (on the right). The histogram shows the distribution of the fake natural disaster effect on MMA vote share. The red line is the effect of the "real" natural disaster.

Where as in the previous estimation $t = 2002, 2008$ for the analysis of the 2005 earthquake and $t = 2008, 2013$ for the analysis of the flood. X_{it} includes $Pashtun_i{*}POST_t$ in the analysis of the earthquake and includes also $frequency_i * POST_t$ in the analysis of the flood.

The distribution of β coefficients obtained from the falsification exercises are illustrated in the Figure 7 were with the red line we indicate the results of running the same regression with the "real" affected status. In the case of the earthquake scenario they lie between -.12 and 0.1 . Only one out the 1000 combinations of placebo assignments of being affected by the earthquake has a more negative effect than the real treatment effect. For the flood scenario coefficients lie between -.04 and 0.04 . Only three out the 1000 combinations of placebo assignments of being affected by the flood has a larger effect than the real treatment effect. These results are encouraging as it shows that there is something specific to the places affected by the natural disasters that creates this big loss in votes, in the case of the earthquake, and a big gain in the case of the flood.

6 Discussion & Conclusion

The results shown above highlight an important determinant of extremist ideology and support for extremist groups. Individuals respond to the way non-state actors and the state provides for them. In particular we show that the efficiency of the state in the post-natural disaster period can move individuals away or to a terrorist organization. Future public policy and research should take into account the complementarity between government relief efforts

and rise of extremist groups in areas with weak institutions and extremism.

The estimates provided in our study show how extremely reactive support for violent groups is with respect to changes in state capacity. In particular, our results shed a light how powerful international aid can be as anti-terrorist tool. For a back of the envelope calculation of the effect of lack of state we can study the difference in funding gap between the two natural disaster we are studying. In the 2005 earthquake around 45% of the aid was already delivered after two months. In contrast in the 2010 flood only 25% was delivered. This 20 percentage points difference is equivalent to around $2 Billion. Given the estimates we have found in Table 1 and 2 the $2 Billion not delivered in international aid moved more 1.3 Million voters to vote for the MMA. For a comparison in 2010 the US spent $181 Billion for the war on terror in Iraq and Afghanistan. These $2 Billion are equivalent to only 4 days of war on terror while at the same time being extremely efficient in reducing radicalization of citizens in the region.

References

Adel, Gholamali Haddad, Mohammad Jafar Elmi, and Hassan Taromi-Rad. 2012. *Muslim Organisations in the Twentieth Century: Entries from Encyclopaedia of the World of Islam.* London:EWI Press.

Ahmed, Zubair. 2013. "Disaster risks and disaster management policies and practices in Pakistan: A critical analysis of Disaster Management Act 2010 of Pakistan." *International Journal of Disaster Risk Reduction*, 4(0): 15 – 20.

Alesina, Alberto, and David Dollar. 2000. "Who Gives Foreign Aid to Whom and Why?" *Journal of Economic Growth*, 5(1): pp. 33–63.

Andrabi, Tahir, and Jishnu Das. 2010. "In aid we trust : hearts and minds and the Pakistan earthquake of 2005." The World Bank Policy Research Working Paper Series 5440.

Beath, Andrew, Fotini Christia, and Ruben Enikolopov. 2012. "Winning hearts and minds through development ? evidence from a field experiment in Afghanistan." The World Bank Policy Research Working Paper Series 6129.

Berman, Eli, and David D. Laitin. 2008. "Religion, Terrorism and Public Goods: Testing the Club Model." *Journal of Public Economics*, 92(10:11): 1942 – 1967.

Berman, Eli, Jacob N. Shapiro, and Joseph H. Felter. 2011. "Can Hearts and Minds Be Bought? The Economics of Counterinsurgency in Iraq." *Journal of Political Economy*, 119(4): pp. 766–819.

Berman, Eli, Michael Callen, Joseph H. Felter, and Jacob N. Shapiro. 2011. "Do Working Men Rebel? Insurgency and Unemployment in Afghanistan, Iraq, and the Philippines." *The Journal of Conflict Resolution*, 55(4): pp. 496–528.

Berrebi, Claude, and Jordan Ostwald. 2011. "Earthquakes, hurricanes, and terrorism: do natural disasters incite terror?" *Public Choice*, 149(3/4): pp. 383–403.

Besley, Timothy J., and Torsten Persson. 2008. "The Incidence of Civil War: Theory and Evidence." National Bureau of Economic Research, Inc NBER Working Papers 14585.

Blair, Graeme, C. Christine Fair, Neil Malhotra, and Jacob N. Shapiro. 2013. "Poverty and Support for Militant Politics: Evidence from Pakistan." *American Journal of Political Science*, 57(1): pp. 30–48.

Blattman, Christopher, and Edward Miguel. 2010. "Civil War." *Journal of Economic Literature*, 48(1): 3–57.

Cole, Shawn, Andrew Healy, and Eric Werker. 2012. "Do voters demand responsive governments? Evidence from Indian disaster relief." *Journal of Development Economics*, 97(2): 167 – 181.

Crost, Benjamin, Joseph Felter, and Patrick Johnston. 2014. "Aid under Fire: Development Projects and Civil Conflict." *American Economic Review*, 104(6): 1833–56.

de Mesquita, Ethan Bueno. 2008. "The political economy of terrorism: A selective overview of recent work." *The Political Economist*, 10(1): 1–12.

Doocy, Shannon, Eva Leidman, Tricia Aung, and Thomas Kirsch. 2013. "Household Economic and Food Security After the 2010 Pakistan Floods." *Food & Nutrition Bulletin*, 34(1): 95–103.

Drury, A. Cooper, Richard Stuart Olson, and Douglas A. Van Belle. 2005. "The Politics of Humanitarian Aid: U.S. Foreign Disaster Assistance, 1964 to 1995." *Journal of Politics*, 67(2): 454–473.

Dube, Oeindrila, and Juan Vargas. 2013. "Commodity Price Shocks and Civil Conflict: Evidence from Colombia*." *The Review of Economic Studies*.

Esteban, Joan, and Debraj Ray. 2011. "Linking Conflict to Inequality and Polarization." *American Economic Review*, 101(4): 1345–74.

Esteban, Joan, Laura Mayoral, and Debraj Ray. 2012. "Ethnicity and Conflict: An Empirical Study." *American Economic Review*, 102(4): 1310–42.

Fair, C. Christine. 2004. "Militant Recruitment in Pakistan: Implications for Al Qaeda and Other Organizations." *Studies in Conflict & Terrorism*, 27(6): 489–504.

Fair, C Christine. 2012. "The US–Pakistan relations after a decade of the war on terror." *Contemporary South Asia*, 20(2): 243–253.

Fair, C Christine, Patrick M Kuhn, Neil Malhotra, and Jacob N Shapiro. 2013. "How Natural Disasters Affect Political Attitudes and Behavior: Evidence from the 2010-11 Pakistani Floods." Princeton University Princeton, New Jersey, USA.

Fearon, James D., and David D. Laitin. 2003. "Ethnicity, Insurgency, and Civil War." *American Political Science Review*, null: 75–90.

Ferris, Elizabeth. 2011. "Earthquakes and Floods: Comparing Haiti and Pakistan." The Brookings Institution.

Hsiang, Solomon M., Marshall Burke, and Edward Miguel. 2013. "Quantifying the Influence of Climate on Human Conflict." *Science*, 341(6151).

Iyengar, Radha, Jonathan Monten, and Matthew Hanson. 2011. "Building Peace: The Impact of Aid on the Labor Market for Insurgents." National Bureau of Economic Research, Inc NBER Working Papers 17297.

Jaeger, David A., Esteban F. Klor, Sami H. Miaari, and M. Daniele Paserman. 2012. "The struggle for Palestinian hearts and minds: Violence and public opinion in the Second Intifada." *Journal of Public Economics*, 96.

Johnson, Thomas H., and M. Chris Mason. 2008. "No Sign until the Burst of Fire: Understanding the Pakistan-Afghanistan Frontier." *International Security*, 32(4): pp. 41–77.

Kronstadt, K Alan. 2010. *Flooding in Pakistan: Overview and issues for congress.* DIANE Publishing.

Norell, Magnus. 2007. "The Taliban and the Muttahida Majlis-e-Amal (MMA)." *China and Eurasia Forum Quarterly*, 5:3: 61–82.

Nunn, Nathan, and Nancy Qian. 2014. "US Food Aid and Civil Conflict." *American Economic Review*, 104(6): 1630–66.

of Pakistan, National Disaster Management Authority (NDMA) Government. 2010. "NDMA Annual Report 2010."

Rennack, Dianne E. 2001. "India and Pakistan: Current US economic sanctions." Congressional Research Service, Library of Congress.

Shapiro, Jacob N., and C. Christine Fair. 2009. "Understanding Support for Islamist Militancy in Pakistan." *International Security*, 34(3): pp. 79–118.

Stromberg, David. 2007. "Natural Disasters, Economic Development, and Humanitarian Aid." *Journal of Economic Perspectives*, 21(3): 199–222.

Wilder, Andrew. 2008. "Humanitarian Agenda 2015: Perceptions of the Pakistan Earthquake Response." Feinstein International Center, Tufts University.

Bringing War Home: Violent Crime, Police Killings and the Overmilitarization of the US Police

Federico Masera*

Abstract

The withdrawal from the Afghan and Iraqi wars has led to the arrival of vast quantities of military equipment to the US. Much of this equipment, now unused by the military, has been redistributed to police departments via a program called 1033. In this paper, I study the causal effect on criminal activity and police behavior of the militarization of the police through this program. I do so by taking into account that military equipment is stored in various disposition centers. Police departments do not pay for the cost of these items but must cover all transportation costs. I then use the distance to a disposition center and the timing of the US withdrawal from the wars in an instrumental variable setting. Estimates show that military equipment reduces violent crime and is responsible for 60% of the rapid drop observed since 2007. More than one third of this effect is caused by the displacement of violent crime to neighboring areas. Because police departments do not consider this externality when making militarization decisions, they overmilitarize. Finally, I show that police militarization increases the number of people killed by the police. Estimates imply that all the recent increases in police killings are due to police militarization.

*Universidad Carlos III de Madrid - Email: fmasera@eco.uc3m.es - Address: Universidad Carlos III de Madrid, Economics Department, C/ Madrid 126, 28903 Getafe (Madrid), España

1 Introduction

Almost 70% of the US population lives under the jurisdiction of a local enforcement agency that is equipped with military weapons. At least 200 operations are deployed by the police each day with these items [Kraska (2007); Coyne and Hall-blanco (2016)]. Although the US police has been partly militarized for many decades, this phenomenon has accelerated quickly with the distribution of over one billion dollars in military equipment during the last few years[1]. These rapid changes in the way public security is provided are not confined to the US. As terrorist threats have escalated recently, many police forces in Europe have increased their use of military equipment[2]. In the developing world, police departments have been heavily militarized for many years, and in some cases the army is directly used in order to fight crime[3].

Although the use of military equipment by police has become widespread around the world, very little is known on its effects. In the US, police militarization has become highly debated following the use of military equipment by police during Ferguson's infamous riots. The debate continued in recent years after President Obama's executive order restricted the use of military equipment by the police. After the killings in July 2016 of five officers in Dallas and three in Baton Rouge, changes to police militarization are being discussed again in the US Congress[4]. On one side of the argument are police departments, sheriff's offices and pro-police movements who defend police militarization as a needed tool for effective

[1]These estimates are calculated using only data from program 1033 the main federal program that allows local enforcement agencies to acquire military weapons in the US. Alternatively, local enforcement agencies could buy military weapons using their own finances or Department of Homeland Security grants. Unfortunately comprehensive data on this type of acquisition of military weapons is not available.

[2]Operation Sentinelle was launched in France after Charlie Hebdo massacre of January 2015 with 10'000 military forces sent across France. In 2016 both Belgian and Dutch police forces were allowed to carry heavy military guns when protecting high-risk sites.

[3]The militarization of public security is particularly present in Latin America. Examples can be found with Mexico where President Calderon send 50,000 soldiers to fight drug-trafficking criminals, PMOP initiative in Honduras against street gangs and Venezuelan President Maduro's decision in 2013 of sending 3,000 soldiers to combat crime in Caracas.

[4]For reference: The Executive Order 13688 reformed the use of military equipment by the police in January 2015. As of September 2016 Amendment 1208 is conferenced with the Senate with the objective of reversing the executive order.

and safe law enforcement. On the other side of the debate are civil liberties and activist groups who see police militarization as a violation of constitutional rights and fear that it will increase police brutality.

In this paper, I contribute to this discussion by providing causal estimates on the effects of police militarization on criminal activity and police behavior. I do so by studying "Program 1033", the main program that transfers military equipment to police departments in the US. When the army began withdrawing from the Afghan and Iraqi wars at the end of 2009, military equipment returned to the US and was then distributed to police departments through this program. In order to estimate the causal effect of this military equipment, I use the fact that, when returning from war, military equipment is available at various disposition centers across the US. I then show that police departments close to these disposition centers are especially prone to be militarized. This was particularly true after the start of the withdrawals from the Iraqi and Afghan wars, when military weapons became massively available. There are two main reasons for this behavior. First, the only cost that police departments have to incur when acquiring military equipment is the transportation cost from the disposition center. Secondly, every police department must appoint an officer to personally inspect the military items before this is requested. Inspections can be cheaper and more frequent if the police department is located near a disposition center. I then use the timing of the US withdrawal from the wars and the closeness to a disposition center to construct an instrumental variable to estimate the causal impact of the militarization of the US police. In the estimation procedure I take particular care of the fact that disposition centers are not randomly located in the US but are a subsample of military bases. I do so by controlling for the closeness to a military base, where a military base may or may not be a disposition center, interacted with year dummies. Because of this the only cross-sectional variation I use comes from the fact that some military bases were selected as disposition centers in 1997, when Program 1033 was created. I then show how before the withdrawal from the wars observables characteristics of places close to military bases are similar between

those that were selected as disposition centers and those who where not.

With this instrumental variable setting I show that police militarization can reduce violent crimes. For each dollar per capita of military equipment in the possession of a police department, violent crime is reduced by 7%. Estimates suggest that Program 1033 has prevented almost 1.8 million violent crimes since its inception in 1997. Most of the prevented crimes are concentrated in the last few years, when militarization has become particularly widespread. Conservative cost estimates predict that 78 billion US dollars have been prevented in costs to the victims of these violent crimes and the US justice system. Additionally, I show how police militarization is an important factor in the recent acceleration in the drop of violent crime in the US. Since 2007, violent crimes have decreased by an impressive 18%. Estimates suggest that more than 60% of this drop is due to police militarization. Finally, I show that at least one third of the effect that militarization has on violent crime is through the displacement of criminal activity to neighboring areas. This displacement effects have important implications for the optimality of the decision to militarize of each police department. When police departments decide on their level of militarization, they need not take into account these negative externalities on neighboring areas. Because of this, police departments are overmilitarized.

I then focus my analysis on one of the most discussed outcomes related to police militarization: police killings. The number of people killed by the police has rapidly increased, rising from 400 in the year 2000 to more than 1000 in recent years. Instrumental variable estimates show that the militarization of the police increases police killings. I show that every 1.6 million dollars spent in military equipment generates an extra police killing per year. My estimates imply that all the recent increases in police killings are due to police militarization through Program 1033. In total, 2200 individuals have been killed due to the militarization of the police caused by Program 1033. Using conservative estimates of the statistical value of life, the total cost in life lost amounts to more than 17 billion US$.

This paper is related to the investigation of the causes and effects of police militariza-

tion. Balko (2014) provides a complete analysis of the history of police militarization and a description of the policies and practices that led to a level of militarization unprecedented in the history of the US. ACLU (2014) reports the results of sending public records requests to 260 enforcement agencies. The study shows how enforcement agencies have become highly militarized due to the use of Program 1033 and that the major use of military equipment is in drug raids. Closer my paper, **?** investigates the effects of Program 1033 on crime and concludes that militarized counties experienced a reduction in street crime level. First, I improve on the identification the causal effects of militarization. Instead of using average military aid by the federal government to predict the cross-sectional variation police militarization I use some predetermined characteristics, namely the geographical distribution of US military bases and disposition centers. This let me be sure that my results are not driven by unobserved factors that the determine the propensity of receiving military equipment. Second, I use more detailed data on police militarization at the law enforcement agency level instead of at the county level. This allows me to study displacement effects and ultimately show the existence of overmilitarization in the US police. I can do that by focusing my study on local law enforcement agencies instead of on the full set of enforcement forces in the US. The main advantage of this approach is that local law enforcement agencies have non-overlapping jurisdictions. Because of this, any increase in militarization in one jurisdiction should have no direct effect on another jurisdiction. Additionally, with this new dataset, I avoid the problem of overrepresenting policing resources in a county that includes the state capital. This problem arises because most state and federal agencies are normally located in the state capital, but their jurisdiction is broader than a county. Finally, I study the effects of militarization on a new outcome: police killings. This phenomenon has lately entered public discussion in relation police militarization and I show that this is an important dimension to consider when evaluating the overall impact of Program 1033. My work is related to Dell (2015), which studies the effects of Mexico's policy against drug-trafficking that involved, among other things, heavy use of military equipment. Estimates show that

this policy actually increased drug-related violence. In my paper, I isolate the effects on crime of having military equipment instead of the more diversified policy studied in Dell (2015). Furthermore, I can provide elasticities of military equipment on crime, as I directly observe how much police departments are militarized.

More broadly, my paper is related to the literature that studies the effects of policing on crime. The most recent literature review can be found in Chalfin and Mccrary (2015). Most related to my analysis are studies that exploit quasi-experiments that attempt to uncover the elasticities of crime to changes in policing. The main threat for credible identification in this literature is the endogeneity of policing. The main concern is that, when police departments expect increases in crime, they boost their policing efforts, thus confounding any potential negative effects of policing on crime. The first paper attempted to address this endogeneity problem is Levitt (1997), which uses the timing of mayoral and gubernatorial elections as an instrument from changes in policing. Di Tella and Schargrodsky (2004) and Draca, Machin and Witt (2011) use terrorist attacks in Buenos Aires and London and the subsequent deployment of police in specific areas of these cities as an exogenous shock to policing to study the effects on crime. Other papers, such as Machin and Marie (2011) and Evans and Owens (2007), use the allocation of additional resources in certain cities in the UK and the US to examine the effectiveness of policing on crime reduction. This literature shows that an increase in policing is generally effective at reducing crime. My main contribution to this literature is the study of a specific change in policing: the use of military weapons by the police. Furthermore, I am the first to provide causal evidence on the determinants of police killings. Additionally, my study uncovers some geographical displacement effects that are in line with classical theories of rational criminals, but for which there has previously been very little empirical evidence. Finally, it is important to note that my estimates are identified from a completely new source of variation. In particular, an differently from the other papers in the literature, I exploit an event that occurred many years before the activation of the treatment to identify the causal effect of policing. In fact, the cross-sectional variation I use

is given by a combination of the position of military bases in the US that were mostly built during the WW2, and the selection of storage facilities that were selected in 1997.

The structure of the paper is as follows: In section 2 I will present the data that is used and how program 1033 works. Section 3 presents the econometric strategy, the main results and discuss the validity of the identifying assumption. In Section 4 I explore the potential mechanisms that could generate these results. Section 5 studies the effect of militarization on police safety and police killings. Finally, in section 6, I present concluding remarks.

2 The 1033 Program and Data

The defense and logistics agency (DLA) is an US combat logistics agency that provides a wide range of logistics, acquisition and technical services to the army, marine corps, navy, airforce and other federal agencies. Of particular interest to my analysis are the services they provide under the reutilization, transfers and donation section. This section of the DLA redistributes military equipment that the department of defense (DoD) declares as excess to its needs. These items are then turned-in to one of DLA's disposition centers that serve as a storage facility. Once these items are received they enter a one week accumulation period, where the items are inspected and cataloged. Then DoD exclusive screening period starts where only DoD agencies can search for military equipment. After that a 21 days screening period starts where police departments and other enforcement agencies may search for excess military equipment. In order to participate in the screening police departments must first join the 1033 program and the application has to be approved by the 1033 program state coordinator and the DLA. After the approval the police department appoints an official to visit their local DLA disposition site. If interested in any item the police department places the request trough the DLA website. The item must have a justification and be approved by the state coordinator and the DLA. The police department that receives an approval for property transfer must cover all transportation costs but doesn't pay for the cost of the item.

The DLA in their dataset provides information on the date, the name of the item, the market value and the receiving enforcement agency for all the excess military equipment transferred through the 1033 program[5]. Since the inception of this program in 1998 more than 8000 enforcement agencies have enrolled in this program. Since 2010 there have been a spike in the use of the 1033 program. As shown in Figure 1 the total value of the items transferred to police departments by the 1033 program has passed from a few millions every year to almost 600 millions dollars in 2014. Furthermore as reported by the American Civil Liberties Union (ACLU (2014)) in this period span no police department has ever returned the military equipment back to the DLA. With this information I can build the value of the stock of military equipment available to all police departments at any point in time by summing up the value in dollars of the the military equipment received up to that point by the police department[6]. The military equipment transferred through program 1033 is extremely varied with almost 7800 type of items. Military vehicles make up almost 55% of the total value that has been transferred. The most common vehicles are mine resistant vehicles and armored trucks. Around 40% of the value is composed by military weapons and equipment. Assault rifles, night vision equipment, camouflage and body armor are some of the most common items. The remaining 5% is comprised of non-tactical items that include computers, electricity generators, recreational and gymnastic equipment.

For crime data I use the Uniform Crime Reporting (UCR) statistics produced by the FBI. This dataset have been published yearly since 1958 and collects data on violent crime and property crime. I then link this data to the militarization data described before by matching the agencies names.

[5]Throughout the paper the analysis is confined to the lowest level of law enforcement in the US. These local enforcement agencies include police department, sheriff offices

[6]In the baseline specification for creating the stock of military equipment I sum up the value of military equipment acquired up to that moment without taking into account any depreciation.

3 Econometric Framework

3.1 Identification Strategy

First I study the direct effect of militarization of the police department on violent crime rate. The first outcome will violent crimes as these types of crime are orders of magnitude more costly to society with respect to non-violent crimes as property crimes or possession of illicit drugs. Formally I would like to estimate the following equation.

$$vc_{i,t} = \alpha_i + \alpha_t + \beta_1 mil_{i,t} + \beta X_{i,t} + \epsilon_{i,t} \quad (1)$$

Where i identifies the police department, t the year, vc_{it} is the rate of violent crime per 1000 inhabitants and $mil_{i,t}$ is the value of the stock of military equipment per capita. A problem of this analysis, that is common to other studies that trying to find how some characteristic of policing affects crime, is the clear presence of an endogeneity problem. First of all, this happens because of a reverse causality problem where police department in which crime rate will increase demand more military equipment. Secondly, there are many potential unobservable characteristics of a police jurisdiction that determine contemporaneously crime and the demand for military equipment. These include the demographic characteristics of the local population, local economic activity, the political situation and many other. The structure of 1033 program let's me uncover the causal effect of the militarization of the police of crime (β_1) by exploiting some exogenous cross-sectional and time variation in the use of the 1033 program.

First of all, I exploit the fact that the excess military equipment available to redistribute via the 1033 program is particularly high when an US military missions ends. In the time frame of interest the main US military operation is the "Operation Enduring Freedom" that started in October 2001 with the invasion of Afghanistan and then expanded in March 2003 in Iraq. As shown in Figure 1 the military involvement in Iraq and Afghanistan steadily increased with a first peak reached in February of 2005 with 181500 soldiers on the ground (161200 in Iraq and 20300 in Afghanistan). After that the level of boots on the ground was

maintained for a few year until the surge of US forces called in Iraq by then US president George W. Bush in January of 2007. The number of military equipment and troops increased rapidly again until August of 2009 when 240500 soldiers were on the ground in Iraq and Afghanistan. From the end of 2009 the US started a slow withdrawal from Iraq that then began a few years later in Afghanistan in early 2012. As shown in Figure 1 the return of troops in late 2009 coincides with the start of the exponential increase in military equipment distributed by the program 1033 to police departments. The timing of the withdrawal from the war allows me to predict the time variation of aggregate military equipment distributed in the US.

For solving the endogeneity problem I need a way of predicting also the large cross-sectional variation observed in the data. In 2009 50% of the US population was living under the protection of a militarized police department. This percentage increased to 65% percent in 2014. Even between the police departments that are militarized there is a huge variation. In 2009 the median militarized police department had 13 cents of a dollar per capita in military equipment with only 15% of them having more than 1 dollar per capita. This cross-sectional distribution rapidly changed after the start of the withdrawal from the war. In 2014 the median militarization is of 71 cents with 43% having more than 1 dollar per capita. For capturing this cross-sectional variation of the militarization of the police I will exploit the fact that police departments close to DLA disposition centers should demand more military equipment from the 1033 program. The main reason for this is that the costs of acquiring items are increasing with the distance to the disposition center. First because, when a police department acquires a military item through the 1033 program the only direct cost it has is the special transportation that has to be arranged from the DLA disposition center to the police department. Secondly, before the acquisition of an item, the agent appointed by the police department has to go to the disposition center to screen the item of interest and inspect its conditions. Is important to remember that most of the items transferred via the 1033 program have been already used in the Iraqi and Afghan wars and their conditions

may vary. Potentially these items may require some repairs and all repair costs have to be sustained by the police department. The screening process is then essential for police departments to not incur in unforeseen repair costs. Additionally, the process of screening is rapid lasting by law a maximum of 21 days. Being able to quickly go to inspect the military equipment of interest is of fundamental importance for a police department. Because of these reasons police departments specially close to the disposition centers are prone to ask more and receive more items from the 1033 program. Figure 2 shows the location of all police departments and the 69 DLA disposition centers that participate in the 1033 program in continental US. As shown in the map disposition center are spread out throughout the US with the median distance of a police department from the closest disposition center of 106Km.

I then combine these two sources of variation (one in time and the other cross-sectional) to try to predict exogenously the militarization of all police departments. This is done with the objective of then using this first stage estimate in a instrumental variable setting to estimate the causal effect of militarization on crime as shown in equation (1). The general specification of the first stage is the following:

$$mil_{i,t} = \alpha_i + \alpha_t + \beta_1 eqp_t * closeness(disp.\,center)_i + \beta X_{i,t} + \epsilon_{i,t}$$

Where eqp_t measures the availability of excess military equipment as proxied by the difference from the peak of the boots on the ground in Iraq and Afghanistan that was reached in 2009 and the subsequent years. This measure eqp_t has been then normalized to 1 in 2014. Formally eqp_t is defined below, where $boots_t$ is the number of boots on the ground that the US military in Iraq and Afghanistan as shown in Figure 1:

$$eqp_t = \begin{cases} 0 & if\ t < 2010 \\ \frac{boot_{2009} - boots_t}{boots_{2009} - boots_{2013}} & if\ t \geq 2010 \end{cases}$$

The variable $closeness(disp.center)_i$ can be calculated in many way using the information shown in Figure 2 of the position of the police department and the DLA disposition centers.

Some natural candidates for the function "closeness" are the distance to the closest disposition center or a dummy indicating if a disposition center can be found in a certain radius from the police department or counting the number of disposition center around a police department.

The main identification assumption behind this strategy is that changes in the violent crime between years of high availability and low availability of equipment are not different between close and far away places from a disposition center other than through the military equipment received by these places. The main threat to the identification strategy comes from the fact that disposition centers are just military bases that has been selected by the National Defense Authorization Act of 1997 as DLA disposition centers for the 1033 program. If police departments around military bases differ, in unobservables that determine changes in violent crime rates, with respect to places far away from military bases this will invalidate the identification strategy. This is a reasonable concern as places close to a military base differ on many characteristics (demographics, labor market structure, political preferences, etc...) and potentially many are unobservable. For this reason in all my specification I will control for the fact of being close to a military base (where a military base may or may not be a DLA disposition center). The military bases that are used as a control are the ones that are currently still open and that could have potentially been selected as DLA disposition centers in 1997. This doesn't include military hospitals, military training centers and joint airports. There are 237 military bases that comply with these characteristics of which as said before 69 were selected as DLA disposition centers.

Formally I will estimate the following 2 stages in an instrumental variable setting:

First Stage:

$$mil_{i,t} = \alpha_i + \alpha_t + \beta_1 eqp_t * closeness(disp.\ center)_i + \beta_{2,t} year_t * closeness(mil.\ base)_i + \epsilon_{i,t}$$

Second Stage: $vc_{i,t} = \delta_i + \delta_t + \theta_1 mil_{i,t} + \theta_{2,t} year_t * closeness(mil.\ base)_i + \gamma_{i,t}$

With the following specification the only excluded instrument is $eqp_t * closeness(disp.center)_i$. Because of this the only cross-sectional variation I use comes from the fact that some military

bases have been selected to be disposition centers in 1997. Is important to notice that this specification discounts the fact that places disposition centers are also military bases and because of this places close to disposition have potentially different trends in violent crime. Furthermore I let the closeness to a military base have a different influence year by year. Because of this I don't impose that the unobservable factors that happen close to a military base happen at the same time as the withdrawal of troops from Iraq and Afghanistan.

3.2 First Stage

As described before there are potentially many ways of combining the information in Figure 2 to create a proper measure of closeness. As a baseline throughout the paper I define a place to be close to a DLA disposition center is if it is located at less than 20Km (air distance) from it. Throughout the paper I will show how results are robust to many other definitions that can be used for closeness to a disposition center. The decision is useful for two reason: First of all is one of the measures of closeness that has the best predicting power. Secondly being a dummy makes let me borrow a lot of language and tools from the treatment and control literature. In particular with this definition is very simple the to define which of the police department are treated and which are not.

As a first visual exploratory analysis in Figure 3 I compare the time-series of the value of the stock of military equipment of police department close to a disposition center (I will call this police departments "treated" throughout the rest paper) to places close to a military base that is not a disposition center (denoted as "placebo treated"). First of all, we can notice how as in Figure 1 that from 2010 onward there is a huge increase in the militarization of police departments. Treated police departments are always more militarized than the placebo treated ones. This difference is just of a few cents per capita until 2009. As soon as the withdrawal from the war in Iraq and Afghanistan happened in late 2009 the difference between these 2 groups of police departments diverged. In 2014 treated police departments had more than 1 dollar per capita of difference in the level of militarization. That is around

a 65% more than the placebo treated police departments.

More formally in Table 1 are reported the estimates for β_1 for the first stage previously described. All regression results are estimated with sample from 2007 to 2014. Column 1 shows the baseline specification that defines a police department as close if situated at less than 20km from a DLA disposition center. The other columns show the robustness the first stage results to other definitions of closeness. In column 2 a police department is defined as close if situated at less than 40km from a DLA disposition center. In column 3 I use the distance in Km and in column 4 the logarithmic distance in Km from the closest disposition centers. In column 5 and 6 I use the number of disposition centers in a radius of 50Km and 100Km.

Table 1 shows formally what could be already noted in Figure 3. Police departments close to disposition centers increase more than far away ones their level of militarization after 2009. This is true using different ways of calculating the closeness to DLA disposition centers.

3.3 Baseline Results

With this identification strategy I'm now able to estimate the causal effect of the militarization of the police on the violent crime rate. The baseline regression results are shown in Table 2. OLS results shown in columns (1) and (2) are consistent with reverse causality where police departments that predict to have increases in violent crimes tend to militarize more. Columns (3) and (4) present the preferred specifications. Both show how militarization per capita reduces the violent crime rate. In particular every dollar per capita in military equipment decreases violent crime by 1.4 per 1000 inhabitant or as shown in column (4) by around 6.4 percent. Finally column (5) shows with the reduced form estimates that places close to a disposition experienced a drop in the violent crime rate after 2009 higher than other places in the US.

For interpreting the marginal effects found in Table 2 notice that in 2014 the average

militarization of a police department in the US is of 3.2 dollars per capita. This amount of money would be enough for a police department of 100000 inhabitants to afford a 10 man fully armed military squad[7]. A police department of these dimensions would have around 3.3 violent crimes a day. The estimates of Table 2 imply that without militarization the daily crimes would be around 4.5 or 4.1 depending if I use the linear of the logarithmic estimation respectively. As shown in this example the militarization of the police has a huge direct effect on the reduction of violent crime.

3.4 Plausibility of Identification Strategy

The previous results hinge on the identifying assumption that violent crime rates between years of high availability and low availability of military equipment are not different between police departments treated and placebo treated other than through the military equipment received by these places. Another way of looking at this assumption is that in 1997 when the program was created the selection made over which are going to be the military bases that are used as disposition centers was not biased towards places that after 2009 will have a higher drop in violent crime.

It seems reasonable to assume that the selection of disposition centers was not actively biased towards places that will experience a disproportionately high drop in violent crime 12 years later. First, because if any we would expect the bias to be in the opposite direction. Military bases could be selected as disposition centers if they are predicted to experience an increase in violent crime around them. If this is the case I could interpret my results as a lower bound of the effect of the militarization on crime and the real effect is potentially even higher. Secondly, is not feasible to predict so many years ahead violent crime trends. This is specially true in the US where the crime has moved spatially a lot in the last two

[7]Expenses for fully equipping a military squad highly depend on the type and quality of items. The example of the 10 man fully armed squad I use includes 1 armored truck, 1 explosive disposal equipment, 2 night-vision googles and 2 thermal sights. Added to this a set of 10 assault rifles, sights and body armor. Depending of the quality of these items it may cost around 320000 dollars of 3.2 per capita for this hypothetical city of 100000 population police department.

decades because of the intensification of the war of drugs, the arrival of new kind of drugs like Oxycontin and the decline of some prosperous industrial cities. Still it could be the case that the places selected as disposition centers where selected because of some other reason that ended being relevant in causing different trends in crime in 2009.

To explore if this is in fact the case in Table 3 I first provide evidence that police departments treated and placebo treated are similar in many predetermined observables that are potentially related to crime. Column 2 and 3 show that treated and placebo treated do not differ in any substantial way. Is also important to notice how a treated police department and ones that not close to a military base (denominated with "Other" in the Table) are instead substantially different. These police departments tend to be smaller in population and bigger in area and have lower crime rates with respect to the treated ones. This observation further validates the identification strategy that is used throughout the paper that controls for the distance to a military base as an included instrument.

As further evidence in favor of the identification assumption I now explore the validity of the parallel trends assumption. For my estimation procedure this assumption states that trends of violent crime would have been parallel between treated and placebo treated police departments in a hypothetical world where both of them would have not been militarized. Even if this counterfactual world is not directly observable in the data I here provide evidence that is consistent with the parallel trends assumption. First in Figure 4 I explore visually if there is a basis to believe that violent crime rates are parallel before 2010, where both treated and placebo treated police departments are practically not militarized. As observed in Figure 4 for the decade previous to the withdrawal from the wars in Afghanistan and Iraq Violent crime rates where slowly decreasing of around 4% in these 10 years. At a first visual inspection time series of violent crimes before 2009 seem parallel between places treated and placebo treated. A more formal test of this important characteristic of the data is left for later in this section. After 2009 police departments in both groups experienced a substantial decrease in violent crime. Police departments placebo treated decreased crime by 11% in

those 5 years while police departments treated experience a decrease of 19%. The main argument of my paper is that this differential decrease in violent crime experienced after 2009 is due to the higher militarization of places close to disposition centers with respect to places close to a military base that is not a disposition center. The differential treatment of the police departments in these 2 groups has been previously visually explored in Figure 3.

As further evidence of the parallel trends assumption in Table 4 are shown the differences between 2006 and 2009 of various criminal outcomes. These differences are computed for the treated, the placebo treated and other police departments as defined before. Of the 14 outcomes I report in Table 4 only 2 have marginally different trends between police departments treated and placebo treated. Importantly, violent crimes trends between treated and placebo treated police departments do not have statistically different trends. This is an encouraging result as it means that in general there where no particular differences between these 2 groups and any change in trends after 2009 could be plausibly attributed to program 1033.

As final evidence of the validity of the identification strategy I perform an event study analysis. The intention here is to formally test the intuition displayed in Figure 4 by comparing in a flexible way if there are any differences between places treated and placebo treated. Then looking if these differences changed after start of the withdrawal of the Iraqi and Afghan war. For checking this I estimate the following regression:

$$vc_{i,t} = \sigma_i + \sigma_t + \sigma_{1,t} year_t * 1(disp.\,center < 20Km)_i + \sigma_{2,t} year_t * 1(mil.\,base < 20Km)_i + \epsilon_{i,t}$$

The sample includes all police departments yearly data from 2000 to 2014. The comparison year has been set to be 2009 the last year before the start of the withdrawal from the wars. The estimates of $\sigma_{1,t}$ are shown in Figure 5. Before 2010, there is no statistical difference between places close and far away from disposition centers. As soon as troops, and more importantly military equipment, returned to the US violent crime around disposition centers starts decreasing faster than in any other place.

3.5 Robustness

In Table 5 I show how the results are robust to the choice of the instrument. In all the specifications the effects of militarization per capita on violent crime are negative. The effects of an extra dollar per capita of militarization varies from -0.8 to a maximum of -1.7. Is important to notice that results may vary because the complier subpopulation for each instrument is different. In particular the decision to use or not program 1033 because you are in the 20Km or 40Km radius from a disposition center is potentially more binding for small/medium disposition centers, as for them also small differences in transportation cost may be very important for the decision of using the 1033 program. This may influence the estimated parameter if we have that the effect of militarization on crime is different for small and large departments. Is also important to notice that there seem to be some clear non-linearities in the use of the program 1033 with respect to distance. Because of this reason column (3) that includes distance from a disposition center linearly is the one the estimation with less predictive power.

Secondly for showing the robustness of the main results I perform the main regression this time including in the sample only places that are less than 20Km from a military base. This regression directly compares only places close to disposition centers and military bases that are not disposition centers without using any information from other police departments. From Table 6 we can observe how all the main results are practically the same both in the direction and the size. This is in part is to be expected as the variation the main regression is using is the different trends in crime post-2009 between places close to a DLA disposition center and other military bases.

As further robustness check I perform the main specification with two alternative way of defining the set of relevant military bases. First of all I include as military bases all military bases in the US even if they are now closed. This add up to 389 military bases as in the main specification only 69 of them are actually DLA disposition centers. In my second specification I include all military bases that are now open even if they couldn't

have been selected in 1997 as DLA disposition centers because of the type of activities that are performed there. These include military hospitals, military bases devoted completely to training or military airports that are joint with civilian ones. In total there are 290 military bases in this specification. In Table 7 results are shown. The main results all hold and the magnitudes are very similar to the main specification.

Finally, in the following econometric exercises I provide further evidence that there is indeed something special that is affecting crime after 2009 in places close to a disposition center that is not happening in any other place in the US. Specially is not happening in other comparable places around military bases that are not disposition centers. For doing that I choose at random 69 military bases and assign them as "fake" disposition centers. I them run the following reduced form regression:

$$vc_{i,t} = \sigma_i + \sigma_t + \sigma_1 eqp_t * 1(FAKEdisp.center < 20Km)_i + \sigma_{2,t} year_t * 1(mil.base < 20Km)_i + \epsilon_{i,t}$$

I repeat this procedure 1000 times and plot in Figure 6 the distribution of the σ_1 with the thick red line indicating the same reduced form parameter with the "real" 69 disposition centers. As shown in Figure 6 in general there is no effect on crime of being close to a fake disposition center. Comparing results with the parameter of the actual reduced form as shown by the thick red line in Figure 6 no combination of military bases assigned as fake disposition centers can replicate the huge negative effects on violent crime of being close to the real disposition centers. The claim of the paper is that the difference between places close to disposition centers and any other place in the US is the preferential access to the program 1033 and ultimately the militarization of these police departments.

As a last check of the robustness of the main results in Table 8 are shown the estimates of a set of IV regressions that do not include in the sample large police departments and another set of regression not weighted by population. The first purpose of this regression is to see how much the results are driven by big police departments. Additionally this regression will inform us on the complier population and if there are any heterogeneous effects along the population dimension. First thing to notice is that in all the regressions the main results

are maintained: Militarization reduces violent crime. These effects are substantially less important with respect to the main results where all police departments are included but the F-statistics of the first stage are bigger. Looking first at the size of the coefficient we can say that militarization is more effective when carried out by big police departments. This is in line with the idea that for effectively using this equipment specialized training is needed. This specialized training and the creation of a full-time militarized squad is only feasible by big police departments that can afford for this training and have at their disposal a bigger amount of officers. Secondly F-statistics increase as big police departments are eliminated from the estimating subsample. This is very informative over which are the compliers of the instruments used in the estimation. What the change of the F-statistic suggests is that big police departments are not part of the complier population. This is again in line with the idea that big police departments do not have as many budgetary constraints when deciding if they should get some military equipment. Because of this, in the context of my estimation strategy, they can be seen as always-takers. In other words, big police departments can afford the transportation cost of military equipment even if located at more that 20Km.

4 Mechanisms

4.1 Displacement Effects

In line with criminals as rational actors, criminals may react to increases in militarization in a jurisdiction by moving there criminal activities to neighboring ones. Is crucial to understand the presence and size of these displacement effects especially for the evaluation of policing policies. First of all, the effectiveness of hot spot policing, that mandates to concentrate policing efforts in places where crime is pervasive, is conditional on how important displacement effects are. Furthermore, more specifically to program 1033, displacements effects may induce the overmilitarization of police. This is due to the fact that militarization decision through the 1033 program are made at the police department level while, if displacement

effects exists, spillovers will be suffered by neighboring police departments as well. Because of this negative externalities not internalized by the police department when making the militarization decision we would observe that in equilibrium police departments are militarized more than optimally.

In this section I'll investigate the presence of displacement effects with the following econometric framework:

$$vc_{i,t} = \alpha_i + \alpha_t + \beta_1 mil_{i,t} + \beta_2 W_i \mathbf{mil_t} + \beta X_{i,t} + \epsilon_{i,t} \quad (2)$$

Where W_i is a weighting matrix that select the range and intensity of the displacement effects and $\mathbf{mil_t}$ is a vector of militarization per capita of all police departments at time t. When evaluating displacement effects as a baseline regression I study spillovers confined by the commuting zone where the police department is located. In average each commuting zone has 76 police departments. So in this specification $W_i\mathbf{mil_t}$ is the average militarization of police departments in the commuting zone of police department i. The analysis of displacement effects adds another endogeneity problem as in equation (2) also $W_i\mathbf{mil_t}$ is potentially endogenous because of reverse causality and omitted variable bias. First, neighboring police departments may decide to increase their militarization because of a general trend in the increase in violence of a certain commuting zone leading to a reverse causality problem. Secondly there are potentially many unobservables that are common to a commuting zone that cause at the same time militarization of a police department and violent crime changes. Because of this I will also use as an instrument the average closeness to a disposition center in the commuting zone.

As shown in Table 9 displacement effects are present and seem to be relatively important. For each dollar per capita spend in a police department commuting zone the violent crime rate increases by 0.5 per 1000 inhabitants. In column (4) where the outcome of interest is the logarithm of the violent crime rate we observe and increase in violent crime of 2.6 percent. This amounts to around one third of the direct effect that the militarization of police has on violent crime.

For interpreting the marginal effects found in Table 9 I return to the example of a police department of 100000 inhabitants that is able to afford a 10 man fully armed military squad. As discussed in the previous chapter a police department of this dimensions would have around 3.3 violent crimes a day in 2014. The estimates of Table 9 imply that without militarization the daily crimes would be around 4.2 and 3.8 depending if I use the linear of the logarithmic estimation respectively. This shows how even if the effect of militarization on violent crime are still sizable the effects as not as large as when the estimation was carried not taking into account displacement effects.

For getting a better sense of the magnitude of the results in Figure 7 I plot in blue the violent crime rate (per 1000 population) from the year 2000 and in red the predicted violent crime rate if there was no militarization of the police. The logarithmic regression shown in Column (4) of Table 9 is used a for predicting this counterfactual scenario. First thing to notice is that since 2007 there has be an acceleration in the secular drop in violent crime in the US. From 2007 to 2014 violent crime has decrease by an astonishing 18.3%. What the counterfactual analysis suggests is that the drop would have been much more contained without program 1033. Violent crime would have dropped only 7.2%. In other words the militarization of the US police trough the 1033 program contributed to 61% of the drop in violent crime experienced between 2007 and 2014.

Another way of quantifying the results is looking at the total effect of 1033 program since it has been implemented in 1997. The estimates shown in Column (4) of Table 9 predict that this program has prevented 1.8 million violent crimes since it's inception. Most of these prevented violent crimes are in recent years. Trying to put a monetary value of to the prevented cost to society produced by the reduction in crime of the 1033 program is not an easy task. First of all, the cost produced by violent crime depends by the type of crime. Secondly, even when a crime is know different methods disagree on cost produced by each crime. An excellent review of the literature is given by McCollister, French and Fang (2010). Using less costly violent crime (that is 42310$ for a robbery) as the most conservative

estimate program 1033 has prevented is 76 Billion US$ in costs.

4.2 Incapacitation or Deterrence

The mechanisms by which more policing may lead to a reduction in crime can be very broadly divided into two categories: incapacitation and deterrence. The first effect is just a mechanical one, where more policing leads to more arrests, less criminals circulating on the streets and consequently less crimes. Deterrence instead arises when rational criminals observe the change in policing and decide as a response to change their amount of criminal activity. From a policy maker perspective is important to understand which of the two mechanisms has caused the drop in crimes. If the main mechanism at play is incapacitation this would create two additional costs for the society: First, incarceration is expensive and this especially true for violent crimes that generally require a long incarceration period. Secondly, the productive possibilities of the individual incarcerated are diminished (both during and after the incarceration). Instead deterrence is a much more desirable mechanism as it doesn't involve any cost to the judicial system and potentially moves economic activities out of the illegal sector.

For detecting which mechanism is at play is important to notice that, if the effect was all due to incapacitation, arrests would increase due to the militarization of the police. Instead, if the mechanism was deterrence, we should observe a decrease in the arrests after a police department gets militarized. As a first way of investigating which mechanisms is at play in Table 10 I look at the effects of the militarization of the police on arrests of violent criminals. Results seem to indicate that arrests have decreased but not in a statistical important way. The effects of the militarization of the police on arrests are always smaller than with respect to the effects it has on crime. This seems to suggest that the mechanisms at play are some combination between incapacitation and deterrence.

For a better understanding of how these two force shape the dynamics of arrests and crimes I study the following econometric framework.

$$Arrests_{i,t} = \beta_i + \beta_t + \beta_{1,t} year_t * 1(disp.\ center < 20Km)_i + \beta_{2,t} year_t * 1(mil.\ base < 20Km)_i + \epsilon_{i,t}$$

Where $Arrests_{i,t}$ is the number of violent crimes cleared by arrest per 1000 inhabitants. I then compare these estimates to the one already reported in Figure 5 that studies the same dynamics for violent crime. Figure 5 show in red the estimates for β_1 for comparison purposes the figures also reports the same estimates for violent crimes in blue. Arrest drop is much less pronounced. Secondly, also the timing of this drop is different. As seen before violent crimes decrease immediately after the withdrawal from Iraq and Afghanistan in late 2009. Instead for arrests the seem to start dropping two years later. This is perfectly in line with a situation where when a police department starts being militarized crimes drop for a combination of incapacitation and deterrence. Because of this arrests remain constant. After a few year deterrence seem to be the main force driving the continuous drop in crimes. This can be explained by a situation where criminals learn about the militarization of the police by observing the arrival of this equipment and this learning process takes time to reach all potential criminals.

4.3 Substituting or Adding Resources

In order to evaluate the cost-effectiveness of program 1033 and understand what mechanisms drive the observed decrease in crime is important to study if other police department resources change as it become more militarized. For doing so I'll use employee data of police departments across the US. The number of employees could decrease, as now with military equipment the amount of work requires less policemen. If this was the case the previously shown estimates where actually underestimating the effects of program 1033 by just examining crime data, as it also would have the effect of saving resources. Conversely, the number of employees could also increase because with military weapons the police departments may decide also to hire specialized trained officers to use this equipment effectively. Indeed the use of this specially trained officers is part of the recommendations given by the White House

in their report studying program 1033. Table 12 shows the instrumental variable estimates of the effect of militarization on different types of employees in a police department. Program 1033 seems to have no effect. This fact is reassuring for the causal interpretation of all the previous results. In particular, when a police department gets militarized given that the number of policemen doesn't change we can assign all the effect in reduction of crime to the arrival of military equipment.

5 Police Safety and Police Killings

One of the main arguments for the militarization of the police is that may improve the safety of police officers. This has become a problem especially in the last decades when criminals, have become armed with more powerful weapons putting in danger the lives of policemen [Police Executive Research Forum (2010)]. Additionally, in the last years there have been some violent acts directly targeted at the police forces that have captured the attention of the public. Just in July of 2016 five officers were killed in Dallas and three in Baton Rouge in two attacks directly aimed at killing policemen. These and other previous incidents led to the creation of a nation wide movement called "blue lives matter" for bringing attention to the numerous deaths in the police forces in the US. One of the potential benefit of the militarization of the police, that the organization "blue lives matter" puts forward, is that the police may do their job without risking of being injured or killed. The reason is that policemen could better protected and are able to detect the presence of potential threats easily with military equipment. On the other side, policemen may be more prone to be involved in more aggressive and dangerous operations now that they are militarized leading ultimately to a higher risk for policemen. Using official FBI data I study the effect of the militarization of the police on deaths and injuries on the job of policemen. A first look at the data shows how each year in the US between 40 to 50 policemen are killed and more than 40000 are assaulted. Table 12 reports the effect of militarization on the safety of the police.

Results show how none of these variables is statistically affected by the militarization of the police. All estimates are positives meaning that potentially the militarization of the police made police officers even more unsafe.

Another important outcome that is often discussed with the rise of militarization of the police the use of deadly force by the police while in the line of duty. Unfortunately data on these killing are either incomplete or come from unofficial sources. One official statistic is provided by the FBI supplementary homicides report that documents an increase in the last years of police killings, reaching a peak in 2013 of 435. Unfortunately agencies are not required to communicate to the FBI about police killings and so any aggregate information is severely unreported. More relevant to the estimation, this underreporting may be not random as agencies may decide to not submit the report exactly in years when these type of homicides are high. The quality of the data of the FBI data and other official sources, like the BoJ Arrest-Related Deaths, has been shown to be very poor [Banks et al. (2015*a*)]. A recent report commissioned by the BoJ [Banks et al. (2015*b*)] shows how at best these official sources have captured around half of all police killings with considerable variability in quality between states.

Because of this unreliability of the official data many non-governmental organizations have tried to create alternative data sources of homicides committed by the police. Even the head of the FBI, James Comey, admitted that unofficial data are the best source of information about police killings[8]. One of the main datasets is the one produced by "fatal-encounters.org" a project that collects and aggregates data from various media news sources and public records. This dataset reports that police killings had rapidly increased in the last years passing from around 660 in 2010 to a peak of 1120 in 2013. These numbers reported by fatalencounters are substantially higher that the one by the FBI but are in line with other efforts of other non-governmental organizations. The newspaper The Guardian has estimated 1146 people were killed by the police in 2015. Similar numbers have been

[8]Declaration by James Comey the 7th of October 2015 at the Summit on Violent Crime Reduction in Washington, DC

estimated by the websites "killedbythepolice.net" and "fivethirtyeight.com". Using the "fatalencounters.org" data, Table 12 shows the effects of the militarization of the police on the number of individuals killed by the police (over 10000 inhabitants). Estimates show that militarization of the police increase police killings. Each dollar per capita more of military equipment increases the number of killing by the police by 0.08 per 100000 inhabitants. This estimate implies that the militarization of the police can explain all of the recent increases in police killings. Around 2200 individuals have been killed due to the militarization of the police caused by the program 1033. Using conservative estimates of the statistical value of life in the US the total cost in life lost amounts to more than 17 billion US$[9]. Another important collateral cost of the increase in the number of police killings is that that police as an institution may lose value and trust in the citizens. From Gallup polls we can see how the confidence in the police is the lowest since 1993 with only 52% of Americans trusting the police. Finally studying the causes of police killings may also give us some insights in an even more prevailing phenomenon that is people injured by the police. As shown by [Miller et al., 2016] in 2012 55400 people where injured by the police. While no systematic dataset is available for studying the causal effect of militarization of police related injuries is reasonable to assume that as police killings have increased due to militarization so have injuries.

When looking at police killings in the US a very important dimension often discussed by the general public is race. Most famously, the activist movement "black live matter", campaigns against what they see as systematic racism and violence by the police against black people. The previously cited Gallup polls on the trust that citizens have on the police show a marked racial gap in this statistic. While 58% of whites trusts the police only 29% of blacks have the same feelings. Famously the DoJ has investigated the Ferguson police department after the protests for the shooting of a black man called Micheal Brown. The investigation indeed found a pattern of racial bias towards the black community. Exploring

[9]Estimates used by government agencies to asses the value of a life vary from 7.9 million dollars use by the Food and Drug Administration up to 9.4 million dollars used by the Transportation Department

if this patterns is present in the US as a whole or is isolated to a few police departments is particularly hard because, as discussed previously, is very difficult to have detailed data on police killings. Unfortunately sometimes even when basic data on a incident is available the race of the victim is not reported. For example, in the data provided by "fatalencounters", 36% of the times race is not reported. Even with this partial information we can observe how blacks are statistically overrepresented in the victims of police killings. Even if blacks represent 12% of the population of the US 31% of the police killings are suffered by blacks. These percentages are in line with other forms of overrepresentation of blacks in the arrested population 28% and incarcerated population 38% [10]. This statistical overrepresentation even if worrisome is not proof of racism by the police. What these numbers may just reflect some underlying phenomenon that is correlated both with crime and being black. With my analysis I can study the possibility of racism in the use of deadly force by the police from another perspective, by looking at the causal effect of the militarization on police killings only of black people. The intuition behind this type of analysis is that the militarization of the police gives more opportunities for the use of the deadly force by the police. If the police is racist they could disproportionately use force against blacks and when the police gets militarized this could lead to an increase especially of police killings of black individuals. As shown in column (4) of Table 12 militarization doesn't influence in a statistically significant way police killings of black people. So what the militarization seem to be doing is to mitigate the overrepresentation of black people in police killings. Again is important to state that this doesn't imply that the police are not racist towards black individuals. Because similarly as what it was discussed before there may be some other underlying characteristics that influence the reaction of police killings to the militarization that are correlated with the race status. Still this result provides some new evidence concerning the important relation between the use of deadly force by the police and race.

[10] Arrests data from the FBI 2013: 9.014 Millions arrests of which 2.549 to Blacks or African American. Incarcerated population in state prisons for more than 1 year in 2013 from BJS: 1.325 Million people of which 0.497 Blacks.

6 Conclusion

This paper studies the effects of the militarization of the police through program 1033 on police behavior and criminal activity. I first document how program 1033 is a major factor in the recent drop in violent crime, being responsible for 60% of the rapid drop in violent crime observed since 2007. The empirical evidence suggests that it does so both by deterring criminal activity and by displacing crime to neighboring areas. This evidence is in line with a model of rational criminal that observe the level of militarization of the police and decide where and how much crime to commit. I then show how militarization of the police increases police killings and program 1033 is responsible for practically all of the recent increase. In total 2200 people have been killed by the police due to the militarization.

Since the unrest that happened in Ferguson in 2014, that brought the militarization of the police in the political debate, program 1033 has been under scrutiny. A congressional investigation started immediately after the riots and in January 2015 program 1033 was reformed banning the reutilization of some types of military equipment. After the five police officers were killed in a Dallas shooting that happened in July 2016 another change of the program is in talks in the Congress in order to reverse the reform of January 2015. This paper provides some important insights for guiding the policy makers discussion. First these elasticities imply that for preventing 818 violent crimes the militarization of the police will generate one extra police killing. Secondly, police militarization seems not to make police officers safer. Finally, the highly decentralized nature of the program leads to an overmilitarization of the US police. This is the result of police officers not taking into account the externalities that are created to neighboring areas when acquiring new military equipment. Any policy that wants to deal with the overmilitarization of the police will have to reform who decides how much to be militarized.

References

ACLU. 2014. "The Excessive Militarization of American Policing." June.

Balko, Radley. 2014. *Rise of the Warrior Cop: The Militarization of America's Police Forces.* PublicAffairs.

Banks, Duren, Caroline Blanton, Lance Couzens, and Devon Cribb. 2015*a*. "Arrest-Related Deaths Program: Data Quality Profile."

Banks, Duren, Lance Couzens, Caroline Blanton, and Devon Cribb. 2015*b*. "Arrest-Related Deaths Program Assessment." March.

Chalfin, Aaron, and Justin Mccrary. 2015. "Criminal Deterrence : A Review of the Literature."

Coyne, Christopher J, and Abigail R Hall-blanco. 2016. "Foreign Intervention , Police Militarization , and the Impact on Minority Groups." *Peace Review.*

Dell, Melissa. 2015. "Trafficking Networks and the Mexican Drug War." *American Economic Review*, 105(November): 1–58.

Di Tella, Rafael, and Ernesto Schargrodsky. 2004. "Do police reduce crime? Estimates using the allocation of police forces after a terrorist attack." *American Economic Review*, 94(1): 115–133.

Draca, Mirko, Stephen Machin, and Robert Witt. 2011. "Panic on the streets of London: Police, crime, and the july 2005 terror attacks." *American Economic Review*, 101(5): 2157–2181.

Evans, William N., and Emily G. Owens. 2007. "COPS and crime." *Journal of Public Economics*, 91(1-2): 181–201.

Kraska, Peter. 2007. "Militarization and Policing - Its Relevance to 21st Century Police." *Policing*.

Levitt, Steven. 1997. "Do electoral cycles in police hiring really help us estimate the effect of police on crime?" *The American Economic Review*, 87(3): 270–290.

Machin, Stephen, and Olivier Marie. 2011. "Crime and police resources: The street crime initiative." *Journal of the European Economic Association*, 9(4): 678–701.

McCollister, Kathryn E., Michael T. French, and Hai Fang. 2010. "The cost of crime to society: New crime-specific estimates for policy and program evaluation." *Drug and Alcohol Dependence*, 108(1-2): 98–109.

Miller, Ted, Bruce Lawrence, Nancy Carlson, Delia Hendriw, Sean Randall, Ian Rockett, and Rebecca Spicer. 2016. "Perils of police action: a cautionary tale from US data sets." *Injury Prevention*.

Police Executive Research Forum. 2010. "Guns and Crime: Breaking New Ground By Focusing on the Local Impact."

7 Appendix

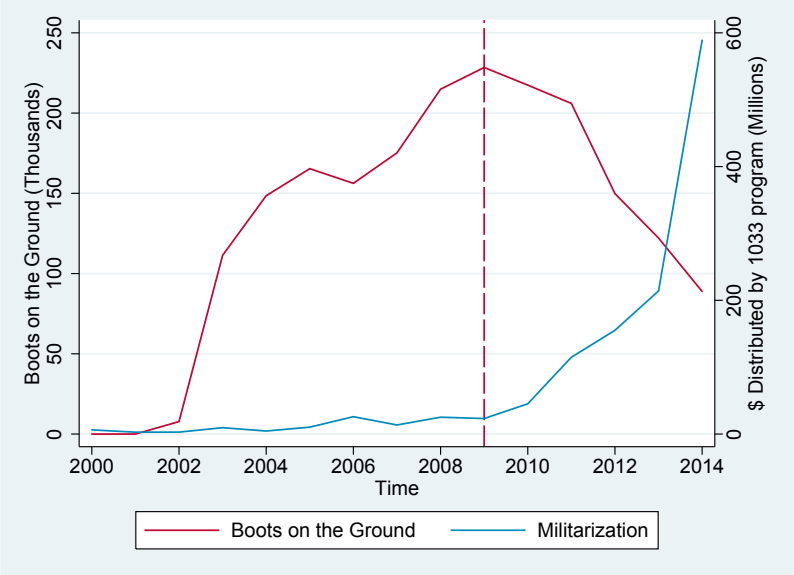


Figure 1: Value of the items transferred by the 1033 program to police departments (Blue) and Yearly average boots on the ground in Afghanistan and Iraq (Red). To the right of the dotted line (after 2009) starts the inflow of item from the withdrawal from the wars

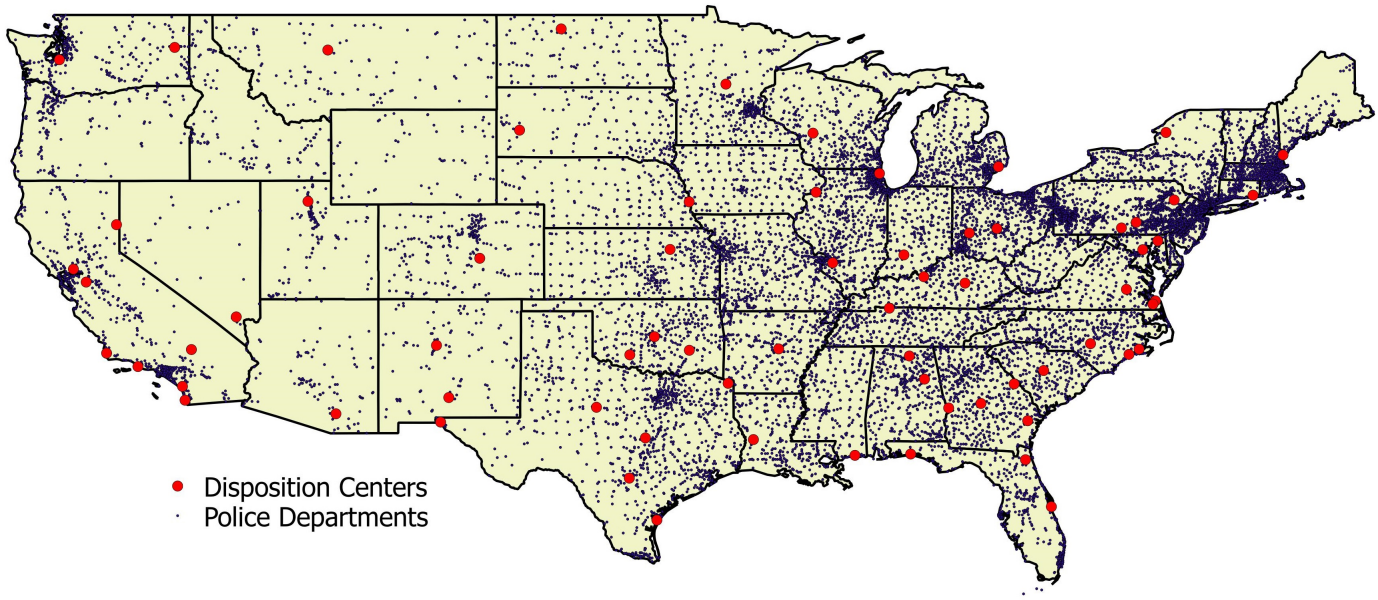


Figure 2: Disposition centers and Local Enforcement Agencies in continental US

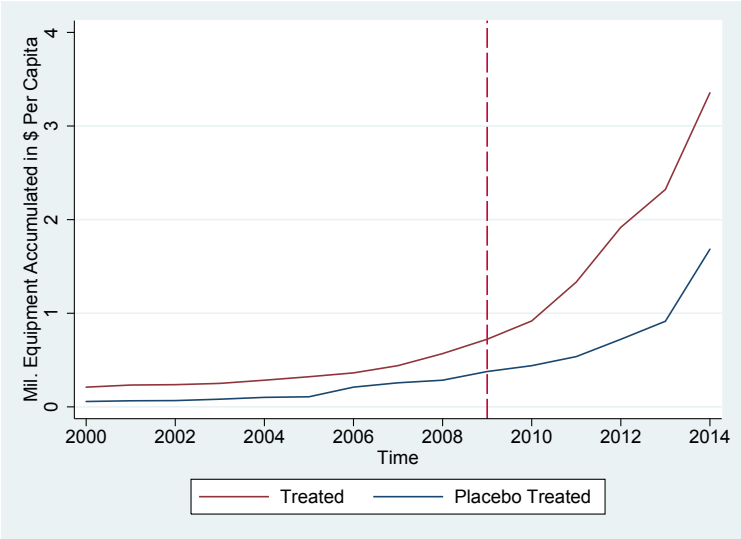


Figure 3: Time series of the stock of military equipment in $ per capita. Blue line for police departments that are at most at 20Km for a disposition center. Red Line for police departments that are at most at 20Km from a military base that is not a police department

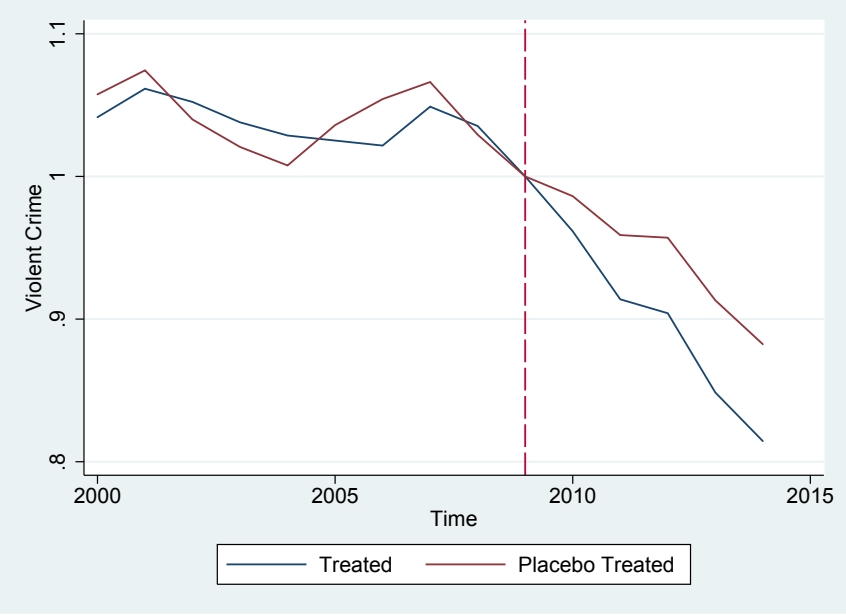


Figure 4: Violent crime rates of police departments close to disposition centers (treated in blue) and police departments close to military bases that are not disposition centers (placebo treated in red). Violent crime rates are normalized to 1 in 2009.

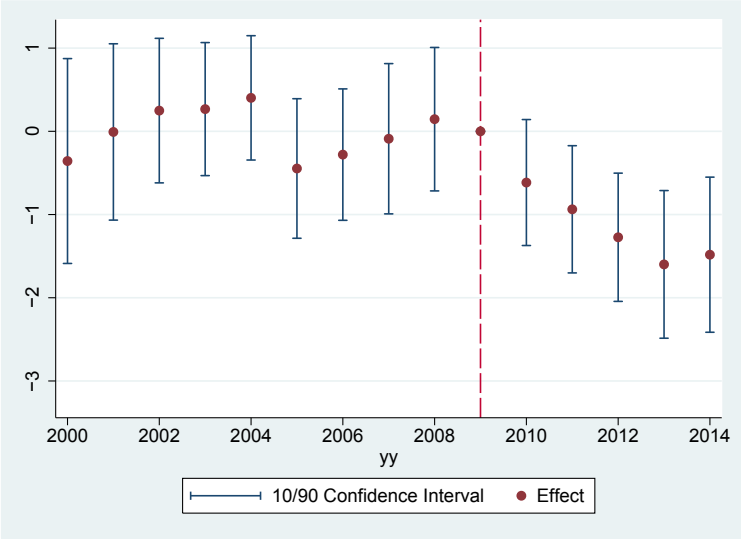


Figure 5: The time series of the reduced form effects $\sigma_{1,t}$ (2009 as comparison year)

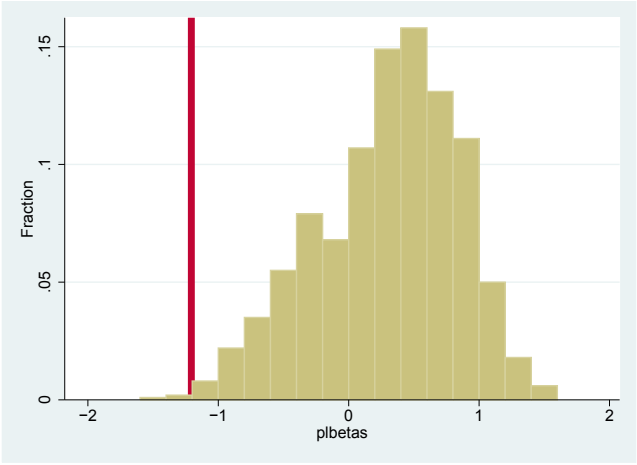


Figure 6: Distribution of the σ_1 of the fake reduced form. With the red line the reduced form with the "real" disposition centers

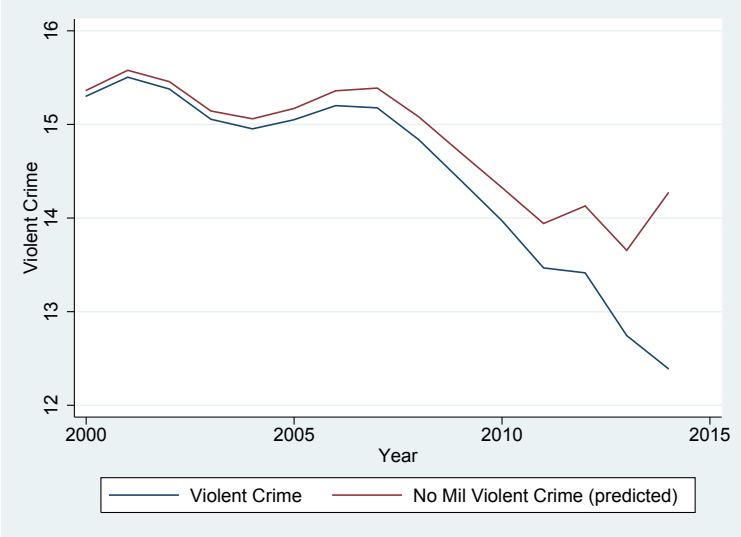


Figure 7: Violent crime rate (blue) and predicted violent crime rate if there was no militarization

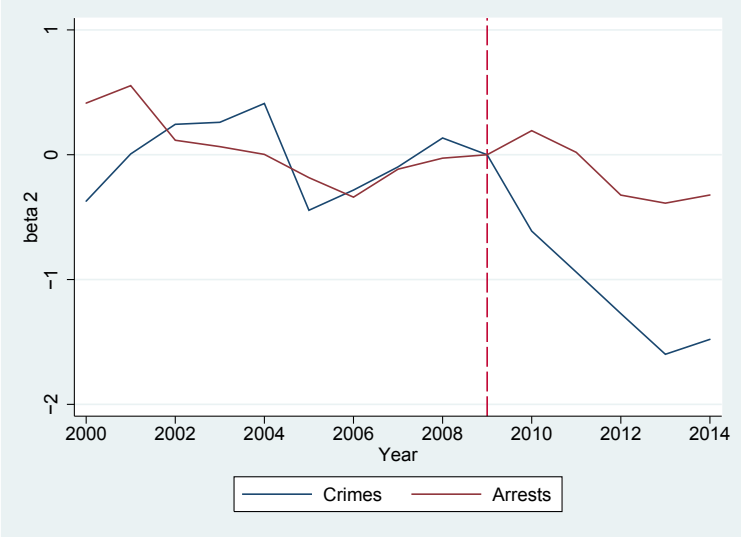


Figure 8: The time series of the reduced form effects $\beta_{1,t}$ (2009 as comparison year)

Table 1: First Stage: Closeness to Disposition Centers and the Militarization of police departments

	<20Km	<40Km	Dist	ln(Dist.)	Num. 50Km	Num. 100Km
β_1	0.863***	0.444**	-0.00163	-0.254**	0.462***	0.396***
	(0.287)	(0.192)	(0.00135)	(0.0984)	(0.152)	(0.130)
Observations	98846	98846	98846	98846	98846	98846
F-stat	29.46	13.63	5.29	21.69	23.65	33.69

Note: The table reports the OLS estimates of the first stage β_1 and clustered standard errors at the state*year level (in brackets). The sample includes all police departments yearly data from 2007 to 2014. In the first 2 columns a police department is defined as close if situated at less than 20km, for column 1, and 40Km, for column 2, from a disposition center. In column 3 I use the distance in Km and in column 4 the logarithmic distance in Km from the closest disposition centers. In column 5 and 6 I use the number of disposition centers in a radius of 50Km and 100Km as a measure of closeness. All regressions include police departments fixed effects, year fixed effects and $year_t * closeness(militarybase)$ and are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 2: Second Stage: Militarization on Violent Crime

	OLS Violent Cr.	OLS FE Violent Cr.	IV Violent Cr.	IV ln(Violent Cr.)	Reduced Form Violent Cr.
Militarization per Capita	0.00341	0.00121	-1.399**	-0.0636**	
	(0.00476)	(0.00192)	(0.553)	(0.0273)	
Eqp. X 1(disp<20Km)					-1.207***
					(0.238)
Observations	99879	99570	99570	95216	99570
Year FE	Yes	Yes	Yes	Yes	Yes
Police Dep. FE	No	Yes	Yes	Yes	Yes
1(Milbase<20Km) * Year	No	No	Yes	Yes	Yes
F-stat			29.58	28.45	

Note: In column (4) the dependent variable is the log of the violent crime rate. In all the other columns the dependent variable is the violent crime rate per 1000 inhabitants. The sample includes all police departments yearly data from 2007 to 2014. The first 2 columns report the OLS estimates of militarization per capita on violent crime rate. Column 3 reports the first stage. Columns 4 to 5 report the IV second stage estimates. Finally Column 65 reports the reduced form evidence of the treatment status. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 3: Comparing Levels of Predetermined Observables

Variable	Treated (1)	Placebo (2)	Other (3)	Difference (1) - (2)	Difference (1) - (3)
Sheriff Department (2009)	0.15	0.12	0.33	0.03	-0.18***
Municipal Level (2009)	0.73	0.71	0.56	0.02	0.17***
Civilian Employees per Capita (2009)	0.89	0.96	0.88	-0.07	0.01
Officers per Capita (2009)	1.84	2.58	1.99	-0.74**	-0.15
Area (2009)	316.11	257.99	502.98	58.12	-186.87*
Juvenile Age (2009)	17.17	16.59	16.01	0.57	1.16***
Violent Crime Rate (2009)	18.12	14.94	13.24	3.17	4.87***
Property Crime Rate (2009)	36.89	31.33	29.07	5.56	7.82***
Population	60357	53518	19422	6839	40935***
% Male (2000)	49.31	48.75	49.10	0.56	0.21
% Latino (2000)	14.90	13.85	12.34	1.05	2.56
% Mexican (2000)	9.92	5.33	7.67	4.58	2.25
% Black (2000)	14.19	18.89	10.69	-4.71	3.50
Criminal Active Population (15-35) (2000)	29.49	30.82	27.58	-1.33*	1.91***
Unemployment Rate (2000)	3.85	3.98	4.08	-0.14	-0.23
% Less Than High-School (2000)	17.12	17.78	20.08	-0.66	-2.96**
Republican Governor (2000)	0.73	0.61	0.61	0.12	0.12
Republican Governor (2005)	0.58	0.71	0.62	-0.13	-0.04
Governor Election (2008-2009)	0.21	0.23	0.16	-0.02	0.04
Governor Election (2013-2014)	0.86	0.83	0.84	0.03	0.02
Participation Presidential Election (2004)	0.59	0.49	0.60	0.09	-0.01
Participation Presidential Election (2008)	0.65	0.54	0.64	0.11	0.01

Note: This table shows some predetermined observables for police departments less than 20Km from a disposition center (Treated), police departments less than 20Km from a military base that is not a disposition center (Placebo Treated) and all the other police departments more than 20Km from a military base (Other). The last two columns tests it tests if there are difference between trated and placebo police departments and betweeen treated and the other police departments. $\star$ 10% $\star\star$ 5% $\star\star\star$ 1% . The first 9 variables (above the doble horizontal line) are at the police department level in the year 2009. The other variables are at the county level. Demographic variables are from the 2000 Census.

Table 4: Comparing Changes between 2006 and 2009

Variable	Treated (1)	Placebo (2)	Other (3)	Difference (1) - (2)	Difference (1) - (3)
Violent Crime	-0.595	-0.851	-0.817	0.256	0.223
Property Crime	-3.798	-3.699	-2.961	-0.099	-0.837
Total Crime	-4.393	-4.550	-3.778	0.158	-0.615
Murder	-0.008	-0.016	-0.006	0.008*	-0.002
Rape	-0.015	-0.035	-0.018	0.020	0.004
Robbery	-0.160	-0.335	-0.130	0.175*	-0.029
Assault	-0.412	-0.465	-0.662	0.052	0.250
Burglary	0.025	-0.379	-0.131	0.405	0.157
Larceny	-1.328	-1.230	-1.649	-0.098	0.321
Motor Vchl. Thefth	-2.495	-2.090	-1.181	-0.405	-1.315**
Officer Killed	-0.000	0.032	-0.001	-0.032	0.001
Officer Assaulted	-0.086	-4.068	-2.039	3.982	1.953
Justifiable Homicide	0.106	0.010	-0.009	0.096	0.115**
Fatal Encounters	0.072	-0.018	0.011	0.089	0.061*

Note: This table shows the change of various outcome variables between 2009 and 2006 for police departments less than 20Km from a disposition center (Treated), police departments less than 20Km from a military base that is not a disposition center (Placebo Treated) and all the other police departments more than 20Km from a military base (Other). The last two columns tests it tests if these changes are different between trated and placebo police departments and betweeen treated and the other police departments. $\star$ 10% $\star\star$ 5% $\star\star\star$ 1%

Table 5: Second Stage: Robustness to Different Instruments

	(1) Baseline	(2) <40Km	(3) Min	(4) ln(Min)	(5) Disp. 50Km	(6) Disp. 100Km
Militarization per Capita	-1.399**	-1.667**	-0.792	-1.053**	-1.173**	-0.792**
	(0.553)	(0.811)	(0.804)	(0.489)	(0.511)	(0.377)
Observations	99570	99570	99556	99556	99570	99570
F-stat	29.58	13.68	5.34	21.86	23.61	34.20

Note: In all columns the dependent variable is the violent crime rate per 1000 inhabitants. The sample includes all police departments yearly data from 2007 to 2014. The table reports IV estimates of θ_1 and clustered standard errors at the state*year level in brackets. In the first 2 columns a police department is defined as close if situated at less than 20km, for column 1, and 25Km, for column 2, from a disposition center. In column 3 I use the distance in Km and in column 4 the logarithmic distance in Km from the closest disposition centers. In column 5 and 6 I use the number of disposition centers in a radius of 50Km and 100Km as a measure of closeness. All regressions include police department fixed effects, year fixed effects and $year_t * closeness(militarybase)$ as inclueded instruments and are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 6: Second Stage: Sample only includes police departments close to a military bases

	(1) OLS	(2) OLS FE	(3) IV	(4) LOG IV	(5) RF
Militarization per Capita	-0.0146***	0.000290	-1.402**	-0.0639**	
	(0.00442)	(0.00270)	(0.552)	(0.0273)	
Eqp. X 1(dist<20Km)					-1.210***
					(0.237)
Observations	11431	11414	11414	11176	11414
Year FE	Yes	Yes	Yes	Yes	Yes
Police Dep. FE	No	Yes	Yes	Yes	Yes
1(Milbase<20Km) * Year	No	No	Yes	Yes	Yes
F-stat			15.46	15.10	

Note: In column (4) the dependent variable is the log of the violent crime rate. In all the other columns the dependent variable is the violent crime rate per 1000 inhabitants. The sample includes all police departments yearly data from 2007 to 2014. The first 2 columns report the OLS estimates of militarization per capita on violent crime rate. Columns 3 to 4 report the IV second stage estimates. Finally Column 5 reports the reduced form evidence of the treatment status. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 7: Second Stage: Different Definition of Military Base

	All Bases		Not Closed	
	(1)	(2)	(3)	(4)
	IV	LOG IV	IV	LOG IV
Militarization per Capita	-1.375***	-0.0550**	-1.612**	-0.0632**
	(0.526)	(0.0260)	(0.628)	(0.0274)
Observations	99570	95216	99570	95216
F-stat	26.76	25.79	28.00	27.02

Note: In column (2) and (4) the dependent variable is the log of the violent crime rate. In all the other columns the dependent variable is the violent crime rate per 1000 inhabitants. The sample includes all police departments yearly data from 2007 to 2014. The difference with the main results is which military bases are selected as control. In the first 2 the closeness to all military bases, even closed ones are used as a included istrument. Columns 3 to 4 all military bases that are not closed are instead used as included instruments. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 8: Second Stage: Droping big cities and not Weighting by Population

	Drop Big Cities		Not Weighted Regression	
	(1)	(2)	(3)	(4)
	Pop<500K	Pop<250K	Pop>5K	Pop>10K
Militarization per Capita	-0.754**	-0.511**	-0.174*	-0.623*
	(0.352)	(0.232)	(0.0987)	(0.326)
Observations	99186	98694	58017	40064
F-stat	37.71	48.81	68.68	23.81

Note: This table reports the IV estimates of the effect of militarization on violent crime. In column (1) and (2) police departments with more than 500000 and 250000 inhabitants are dropped repectevely. Column (3) and (4) report the results without weighting for population and dropping police departments with less tahn 5000 and 10000 inhabitants respectively. The sample yearly data from 2007 to 2014 at the police department level. In all columns clustered standard errors at the state*year level are reported in brackets. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 9: Displacement Effects

	(1) Baseline	(2) CZ mil	(3) Baseline	(4) CZ mil
Militarization per Capita	-1.399**	-1.558**	-0.0636**	-0.0718**
	(0.553)	(0.696)	(0.0273)	(0.0348)
CZ Militarization per Capita		0.499*		0.0259**
		(0.267)		(0.0132)
Observations	99570	99540	95216	95190
F-stat	29.58	11.48	28.45	11.04
Pvalue Underindentification	.003	.008	.003	.008
F-stat 1st Stage mil		20.89		20.73
F-stat 1st Stage CZmil		110.33		110.11
Corr(instr.,CZ instr.)		.064		.064

Note: In columns (1) and (2) the dependent variable is the violent crime rate per 1000 inhabitants, in columns (3) and (4) the dependent variable is the log of this violent crime rate. The sample includes all police departments yearly data from 2007 to 2014. The table reports IV estimates of β_1, β_2 and clustered standard errors at the state*year level in brackets. All regressions include police department fixed effects, year fixed effects and $year_t * 1(militarybase < 20km)$. Regressions are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 10: Arrests

	(1) OLS	(2) OLS FE	(3) IV	(4) LOG IV	(5) RF
Militarization per Capita	0.00543**	0.000612	-0.438	-0.0581	
	(0.00270)	(0.00137)	(0.332)	(0.0482)	
Eqp. X 1(disp<20Km)					-0.262*
					(0.154)
Observations	94353	94087	94087	87181	94087
Year FE	Yes	Yes	Yes	Yes	Yes
Police Dep. FE	No	Yes	Yes	Yes	Yes
1(Milbase<20Km) * Year	No	No	Yes	Yes	Yes
F-stat			14.71	13.91	

Note: In column (2) the dependent variable is the log of the arrests due to violent crimes per 1000 inhabitants. In all the other columns the dependent variable is the number of arrests due to violent crimes per 1000 inhabitants. The sample includes all police departments yearly data from 2007 to 2014. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 11: Employees Police

	(1) Employees	(2) Policemen	(3) Civilians
Militarization per Capita	0.0101	0.0201	-0.0100
	(0.0325)	(0.0203)	(0.0317)
Observations	118626	118626	118626
F-stat	39.54	39.54	39.54

Note: The table reports instrumental variable estimates. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. The sample includes all police departments yearly data from 2007 to 2014. The dependent variables the are number of total employees, policemen and civilian employees every 1000 citizens. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*

Table 12: Police Safety and Police Killings

	(1) Officers Killed	(2) Officers Assaulted	(3) Police Killings	(4) Police Killings (Blacks)
Militarization per Capita	0.0250	4.529	0.0782**	0.0136
	(0.0228)	(4.195)	(0.0391)	(0.0147)
Observations	21156	21156	130536	130536
Year FE	Yes	Yes	Yes	Yes
Police Dep. FE	Yes	Yes	Yes	Yes
1(Milbase<20Km) * Year	Yes	Yes	Yes	Yes
F-stat	18.44	18.44	43.45	43.45

Note: The table reports instrumental variable estimates. In all columns clustered standard errors at the state*year level are reported in brackets. Regressions are weighted by population. The sample includes all police departments yearly data from 2007 to 2014. The dependent variables are the number of officers killed, officers assaulted, police killings and police killings of black people every 100000 citizens. ** p-value<0.10, ** p-value<0.05, *** p-value<0.01*